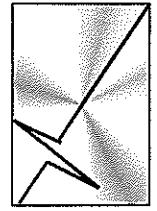


Evenson/FILE

*Helical Foundations....
Something brilliant
under the Sun*

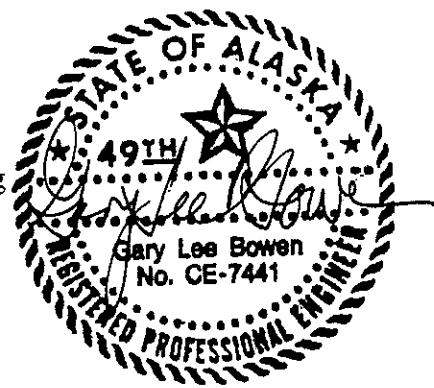


This is the outboard pile at location #86. Note the sawn brace and the partial pile cap support.

A Proposed Repair Plan for the Pelican Boardwalk

Prepared for:

Alaska Department of Transportation
and Public Facilities
Southeast Region Design and Engineering
PO Box 112506
6860 Glacier Highway
Juneau, AK 99801-2506



OCTOBER 2006

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A Proposed Repair at the Pelican Boardwalk

Table of Contents

Summary: Drawings and estimated costs are given for proposed urgent repairs at the Pelican boardwalk. The estimate to complete the piling and piling cap repairs using helical piers is estimated at \$276,000 based upon the contractor working continuously from above the water. The other supporting urgent work is estimated at \$42,000. The work costs include tying back the boardwalk laterally as required.

All costs are with imported labor. If local labor is used and the boardwalk is replaced with identical materials on force account, the costs could be from much higher (perhaps twice) to something comparable. This is because of the difficulty of the work required in the tidal zone. It is suggested that the City of Pelican propose their own budget for labor and materials to complete the Table 4 repairs based on their own estimates of productivity.

Purpose

References

General Situation

Repairs per Table 4

Costs

Appendix I

Costs

Appendix II

Table 4

Appendix III

Pier Calculations

Appendix IV

Beam Calculations

Appendix V

Almita Product Drawings and Helical Pier Literature

Appendix VI

Photographs

Appendix VII

Contractor Requirements, Specifications, and General Notes

Figure 1:

Wooden Brace Replacement

Figure 2:

Piling and Piling Cap Repair

Figure 3:

Tieback Installation

A Proposed Repair at the Pelican Boardwalk

Table of Contents

Summary: Drawings and estimated costs are given for proposed urgent repairs at the Pelican boardwalk. The estimate to complete the required repairs is from \$323,000 to \$535,000 depending on how the work is performed and whether local labor is used or not. The basic choice is whether replacement in kind or another type of repair is used. A well managed force account program can compete with an all contractor work repair utilizing local hire at about \$325,000 each.

1.0 Purpose

2.0 References

3.0 General Situation

4.0 Repairs per Table 4

5.0 Mobilization and De-mobilization

6.0 Complete Materials Listing

7.0 All Labor and Equipment Needed

8.0 All Work in the Waters of the US

9.0 Disposal Requirements of Removed Materials

10.0 Recommended Phased Implementation of Repairs

11.0 Construction Inspection Requirements and Costs

12.0 Testing and Certifications

13.0 Cost Summaries

Appendix I Cost Calculations

Appendix II Table 4

Appendix III Pier Calculations

Appendix IV Beam Calculations

Figure 1: Piling and Piling Cap Repair (Helical Pier Work)

Figure 2: Tieback Installation (Helical Pier Work)

Figure 3: Brace Replacement (Replace in Kind and Other Helical Pier Work, Common Work)

Figure 4: Piling/Pile Cap (Replace in Kind)

Figure 5: Materials and Equipment List

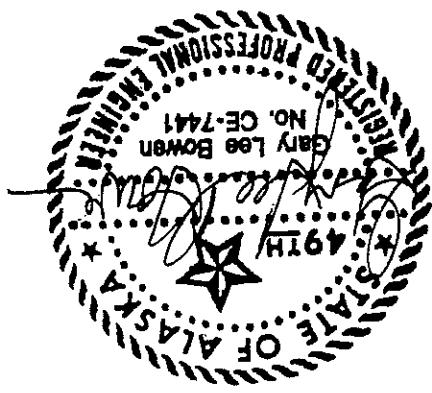
Figure 6: Cost Summary

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BOWEN ENGINEERING

OCTOBER 2006



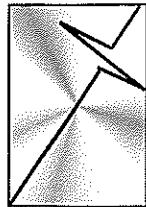
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Prepared for:

A Proposed Repair Plan for the Pelican Boardwalk

support:

This is the outboard pile at location #86. Note the sawn brace and the partial pile cap



HeliCat Foundations...
Something brilliant
under the Sun

REVIEWED/FILE

Summary: Drawings and estimated costs are given for proposed urgent repairs at the Pelican boardwalk. The estimate to complete the piling and piling cap repairs at the Pelican boardwalk is estimated at \$276,000 based upon the contractor working continuously helical piers is estimated at \$42,000. The work above the water. The other supporting urgent work is estimated at \$42,000. The work costs include tying back the boardwalk laterally as required.

All costs are with imported labor. If local labor is used and the boardwalk is replaced with identical materials on force account, the costs could be from much higher (perhaps twice) to something comparable. This is because of the difficulty of the work required in the tidal zone. It is suggested that the City of Pelican propose their own budget for labor and materials to complete the Table 4 repairs based on their own estimates of productivity.

Purpose	General Situation	Repairs per Table 4	Costs
Referrals	General	General	Costs
Appendix I	Table 4	Table 4	Costs
Appendix II	Pier Calculations	Pier Calculations	Costs
Appendix III	Bream Calculations	Bream Calculations	Costs
Appendix IV	Almita Product Drawings and Helical Pier Literature	Almita Product Drawings and Helical Pier Literature	Photographs
Appendix V	Contractor Requirements, Specifications, and General Notes	Contractor Requirements, Specifications, and General Notes	Wooden Brace Replacement
Appendix VI	Figure 1:	Figure 2:	Tieback Installation
Appendix VII	Figure 3:	Figure 4:	Figure 5:

Summary: Drawings and estimated costs are given for proposed urgent repairs at the Pelican boardwalk. The estimate to complete the required repairs is from \$323,000 to \$535,000 depending on how the work is performed and whether local labor is used or not. The basic choice is whether replacement in kind or another type of repair is used A well managed force account program can compete with an all contractor work repair utilizing local hire at about \$325,000 each.

1.0 Purpose
2.0 References
3.0 General Situation
4.0 Repairs per Table 4
5.0 Mobilization and De-mobilization
6.0 Complete Materials List
7.0 All Labor and Equipment Needed
8.0 All Work in the Waters of the US
9.0 Disposal Requirements of Removed Materials
10.0 Recommended Phased Implementation of Repairs
11.0 Construction Inspection Requirements and Costs
12.0 Testing and Certifications
13.0 Cost Summaries

Appendix I	Cost Calculations	Table 4	Pier Calculations	Beam Calculations	Appendix IV	Figure 1:
Appendix II						Figure 2:
Appendix III						Figure 3:
Appendix IV						Figure 4:
Materials and Equipment List	Piling/Cap (Replace in Kind)	Brace Replacement (Replace in Kind and Other Helical Pier Work, Common Work)	Brace Replacement (Helical Pier Work)	Tieback Installation (Helical Pier Work)	Tieback Installation (Helical Pier Work)	Figure 5:
Cost Summary						Figure 6:

Table of Contents

A Proposed Repair at the Pelican Boardwalk

Although Table 4 represents the most urgent activity, there are other deficiencies noted in Table 1: Bents with no cross bracing; Table 2: Railing problems and locations, and; Table 3: Connecting walkways requiring attention.

4.0 Repairs per Table 4:

The design vehicle for the boardwalk is a fire truck. PND found by a load rating analysis that the structure is greatly over stressed by the design vehicle. From this rating analysis a list of structural elements was generated to increase the rating. The most important and urgent recommended repair information is presented in Table 4. Table 4 is the basis of this effort. That is, to present means and methods to correct the most urgent issues found during the PND inspections.

Reference 1 contains detailed records of building, material orders, drawings, and repairs dating from as early as 1950. Most significant construction probably occurred on the hillside is rocky and very steep. A land based continuous access road appears impossible. Generally houses or commercial buildings with a steep hillside behind. In places this utilities flow along this line of communication. The land side of the boardwalk is Pelican is connected by a single boardwalk. All commerce, emergency services, and boardwalk in the early 1960s. There is, however, evidence of a boardwalk earlier since the 1960s work was noted as reconstruction. Consequently, the majority of the boardwalk may be approximately 40 years old if not older. Repairs in selected locations have been ongoing since the original work. The school loop appears to have been built in the mid-70s. The PND study noted as Reference 1 has a summary of their investigation into the boardwalk records.

3.0 General Situation:

- (1) Pelican Boardwalk Inspection and Condition Assessment, Peratovich,
- (2) Element Inspection, George Limsen and Tim Doggett, DOTF, June 28, 2005.
- Nottingham and Drage, Inc. (PND), September 29, 2003 (field work performed in 2002).

2.0 References:

The purpose of this communication is to present a repair plan with associated estimated costs for the most urgent repair issues at the Pelican Boardwalk. These issues are given as Table 4 in Reference 1.

1.0 Purpose:

A Proposed Repair at the Pelican Boardwalk

- The calculations indicate that 3-1/2 inch pipe piers will be suitable to support the loads. A total length of 28 feet has been set as the most probable maximum installation length. There is a possibility that these piers could be damaged by floating debris forced against them by high winds, tides, and waves. This possibility seems remote because the winds would need to come down Lisienski.

Cautions:

- Some experimentation with new products is in order. Driven or set wooden pilings are always be some load taken by the piles and pile caps until they are replaced entirely. This means the repair creates a system in duplex for added safety and functionality.
- The boardwalk was recommended by PND to be replaced within 10 years of their 2003 report. There is only an obligation to keep the boardwalk functional, not identical in appearance. Although helical residents may be anxious to keep the character of the boardwalk the same, the slender steel piling should not be driven.
- The boardwalk was recommended by PND to be replaced within 10 years of their report. There is only an obligation to keep the boardwalk functional, not impossible to get a barge or crane in position to drive piles in this location. Steel driven pilings can be drilled in from above. Steel helical piers can be screwed into the ground in any size up to nearly 2 ft in diameter. The size is only limited by the ability of the boardwalk to take the weight of the installation machinery.
- The installation of helical piers is quiet without the noise and ground vibration of driven piling.
- Once installed the steel helical piers can be protected with sacrificial zinc anodes. Preservation of wood, once in the seawater, is not an option.
- The calculations indicate that 3-1/2 inch pipe piers will be suitable to support the loads. A total length of 28 feet has been set as the most probable maximum installation length. There is a possibility that these piers could be damaged by floating debris forced against them by high winds, tides, and waves. This is not a one for one replacement of the existing boardwalk material with a like item.

The argument for the current detail is as follows:

Figure 1 indicates a proposed piling and/or pile cap repair. Helical piers are utilized. The pier installation requires the width of a Bobcat (about 6 ft with a blade on it). Only one decking plank at a time requires removal for a helical pier so a steel plate or sheets of plywood can be placed on the other side during construction.

It is difficult to separate the mobilization/demobilization from the shipping because the contractor's equipment and materials would probably be brought to Pelican by a landing craft. Even in the case of local labor, equipment would probably need to be shipped with materials. See Appendix I calculations and Figure 6 for details.

5.0 Mobilization and De-Mobilization

Figure 4 shows piling and pile cap replacement based upon replacement in kind. This is inter-tidal work that will impact the boardwalk use during construction. For a pile cap replacement, boardwalk access will certainly be an issue. There is also a contingency impact by removing existing decking, stingers, and railings.

Cross bracing work is in the tidal zone and it will require access from that zone. This will make it inefficient work between the tides. A larger bolt than the existing bolt has been chosen to try and tighten up in the hole more.

Figure 3 indicates a typical proposed cross bracing detail. Although apparently a simple proposal, it is not. There have been utilities run beneath the boardwalk and a number of cross braces have been removed or cut to allow the passage of these utilities at lower levels. On a case by case basis braces may still be installed but they will need to be relocated higher or lower and, perhaps, in some cases braced to the pile cap above or the utility carrier below. Furthermore, some angle adjustment will be required because a 45 degree angle might not be attainable.

Figure 2 shows a helical pier tieback. Underpinning technology is the only effective way to deal with lateral loading or restrain leaning tendencies. Even if the boardwalk is prepared as in historic structure, lateral tiebacks using underpinning should still be considered.

- Inlet from the NW. The boardwalk is also fairly well sheltered within the harbor. If the possibility of storm damage seems at all likely, the piers can be set inside the existing piling for additional protection and even braced with steel angle.
- The loading from the utilities has not been considered. There is adequate strength in the piers to handle additional loading, particularly when applied low. In order to pick this load up it would require a 5 ft piece of 8 inch x 3/8 inch angle.
- (galvanized) welded to the piers (one each side). This would go under the wooden support that now holds the utility lines. This means the piers would need to be set inside the piling laterally and a cross brace moved. Note that even with the piers installed, there will be residual strength in the piling, pile caps and the utility cross brace.
- The presence of the pier installation equipment will prevent emergency vehicles from using the boardwalk. It is suggested the City of Pelican emergency personnel and contracting personnel use walkie-talkies. In the event of an emergency, the installation equipment can be moved as soon as possible.
- If this boardwalk is classified as in historic structure, it may not be possible to use to deal with lateral loading or restrain leaning tendencies. Even if the boardwalk is to deal with lateral loading or restrain leaning tendencies. Even if the boardwalk is prepared as in historic structure, lateral tiebacks using underpinning should still be considered.

A complete materials and equipment listing is given in Figure 5. Note that there are going to be some miscellaneous but minor items not identified. For example, when pressure treated or creosoted materials are cut, a preservative needs to be applied to the cut. Similarly, PND was critical of the railings and thought they required clips rather than just being nailed. These and other miscellaneous and minor items can be expected to appear in an absolutely complete materials listing.

A complete materials and equipment listing is given in Figure 5. Note that there are going to be some miscellaneous but minor items not identified. For example, when pressure treated or creosoted materials are cut, a preservative needs to be applied to the cut. Similarly, PND was critical of the railings and thought they required clips rather than just being nailed. These and other miscellaneous and minor items can be expected to appear in an absolutely complete materials listing.

Equipment needs are identified in Figure 5. Labor needs are identified in Appendix I for costing purposes. Note that for replacement in kind, particularly by force account, the labor estimates may vary considerably. The work methods and the sense of urgency can be advised of approximately 20 cu yards to be dug out for set pilings. This is the only work that would be in the water although other work will be required under the boardwalk making wood repairs. Since DOTF has already launched their environmental permitting process, no additional information is required here.

The work in Table 4 identifies 19 pilings to be replaced. DOTF environmental staff has been advised of approximately 20 cu yards to be dug out for set pilings. This is the only work that would be in the water although other work will be required under the boardwalk making wood repairs. Since DOTF has already launched their environmental permitting process, no additional information is required here.

6.0 Complete Materials Listing

7.0 All Labor and Equipment Needed

8.0 All Work in the Waters of the US

Equipment needs are identified in Figure 5. Labor needs are identified in Appendix I for costing purposes. Note that for replacement in kind, particularly by force account, the labor estimates may vary considerably. The work methods and the sense of urgency can be advised of approximately 20 cu yards to be dug out for set pilings. This is the only work that would be in the water although other work will be required under the boardwalk making wood repairs. Since DOTF has already launched their environmental permitting process, no additional information is required here.

The disposal of removed materials is most readily accomplished by storage on City of Peñicán property. Creosote treated wood can be buried if it does not generate black smoke (per DEC advice by telecomm). Because the creosote is probably well leached out, this is probably not a problem. If there is not too much rot, the wood might be suitable for burning for home heating after drying (covered storage for a period of time).

Treated wood contains metals and other poisons. Again, it can be stacked, covered and dried for some other reuse. Seldom is an entire piece of wood rotten, but only a portion of it. It is suggested the wood be stacked under cover (tarpaulin) and left to dry out.

In the cost estimates, only the cost to move the wood has been estimated. Table 4 generates small quantities. For large quantities, other arrangements for disposal should be made.

Table 4 work should be done in a continuous manner without interruption. The project is too small in scope to be done in phases. If full funding is not available, a delay is appropriate until funding can be arranged.

10.0 Recommended Phased Implementation of Repairs

Bent 5: Outside stringer/4 x 8 cracked	Bent 6: Board beneath 2 nd pile shoreline replacement	Bent 23: Blocking between outside (water side) pile and pile cap	Bent 141: 3 x 6 pipe support beam	Bent 145: Stringers. One rotten stringer, others not bearing on pile cap	Bent 146: Stringers. One rotten stringer, others not bearing on pile cap	Bent 147: Stringers. One rotten stringer, others not bearing on pile cap
--	--	--	-----------------------------------	--	--	--

- Work directly related to the installation of helical piers should be done by the helical pier contractor. That is, the 12" x 12" wooden blocking and the 6" x 12" metal replacement piles should be placed by the pier installer. Otherwise this work might inconvenience the pier installation schedule.
- Work done by force account as replacement in kind will be assumed to be done by local labor.
- Work done by force account in kind will be assumed to be done by local labor, also identifies this additional work.
- The fitting of braces and other work listed in Table 4 can be done by others that may be contracted or local labor. The number of braces requested to be replaced is identified in Figure 3, Table 4, however, also identifies this additional work.

In order to calculate the costs, it is necessary to break down the different tasks and to whom they should be directed.

13.0 Cost Summaries

There are no testing requirements deemed necessary for this project. The certifications by the installer from the factory to install the factory product, quality control program by factory including ISO 9000 compliance for product (other work material certification requires checking as to the supply of the wood requested (quantity and quality), check for plated nails instead of hot dip galvanized, check all bolts and lag screws as to quality and quantity).

In order to calculate the costs, it is necessary to break down the different tasks and to whom they should be directed.

12.0 Testing and Certifications

All materials are subject to inspection for certification of compliance with plans and specifications.

Replacement in kind is easier to inspect since no special inspections are required.

Generate the greater need for inspection if it was selected. Periodic special inspection is required to be certain the pier installation is in accordance with the plans and specifications. Power head calibration relationships require verification. Welding would also require special inspection.

See Appendix I and Figure 6 for cost details. Essentially, the helical pier work would generate the greater need for inspection if it was selected. Periodic special inspection is required to be certain the pier installation is in accordance with the plans and specifications. Power head calibration relationships require verification. Welding would also require special inspection.

11.0 Construction Inspection Requirements and Costs

Bent 148: Two rotten stringers
Bent 186: Stringer. Cracked stringer.

The first work item would be bid as helical pier work. The second item would be bid as general rough carpentry. The wages to be paid on this project are to be Davis-Bacon scale.

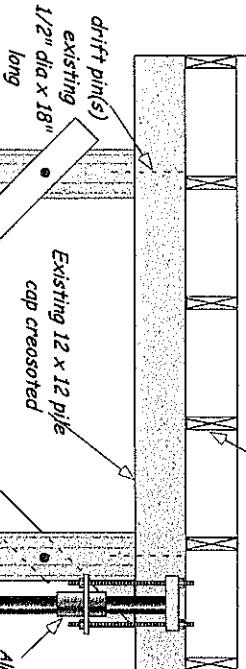
See Appendix I and Figure 6 for costing detail.

G. L. Bowen
10/14/2006
END

p.t. 3 x 12 decking

p.t. 3 x 12 joists

*New 12 x 12 p.t. blocking
trim brace,
as required*



NOTES

(1) Two 3-1/2 inch OD pipe piers with 10" x 12" helix lead sections required per piling.

Maximum shaft torque or limit of 8500 ft-lb power head. Product shown is of Almita manufacture but other equivalent products are satisfactory if bracket is aligned vertically.

(2) If rock is present so the pier cannot penetrate the ground, break out an 18 in diameter x 2 ft deep hole and set the pier shaft in concrete. Make a "hot" mix to set up between tides.

(3) If upper portion of existing piling is so rotten or otherwise deteriorated that existing brace is no use set new 3" x 8" p.t. brace to pile cap. If base of piling is too deteriorated to accept wooden brace, set tieback per Figure 2. Almita tension clamps are tied to pier. For purposes of estimating costs and quantities assume worst case. If pile cap is also deteriorated, attach to new blocking. Attachment is by nailed cleats to new blocking (not shown).

(4) Lag lifting brackets into blocking with (2) 3/4" x 8" lag screws from bottom of bracket plate.

(5) Pipe piers and brackets to be hot dip galvanized per ASTM A53.

(6) All piers to be filled with passivated neat cement grout. 100 ppm Cr-O₃ by weight to cement.

(7) All replacement wood to be suitable for structural joists and planks, #1 Douglas Fir (north) or better, no #2, #3, or economy grades to be used.

(8) Replacement wood to meet AWWA Standard C18-03.

(9) Identified positions from the 2003 boardwalk inspection for piling replacement are pier #: 21 (left); 59 (left); 60 (left); 68 (left); 69 (left); 86 (right); 137 (seaward); 142 (seaward); 158 (seaward); 175 (left); 177 (right); 179 (left); 186 (left); 188 (seaward); 189 (right); 197 (right, left); L67 (right, left). Note that additional piling replacement may be required since the 2003 inspection. Total number piling replacement this item: 19.

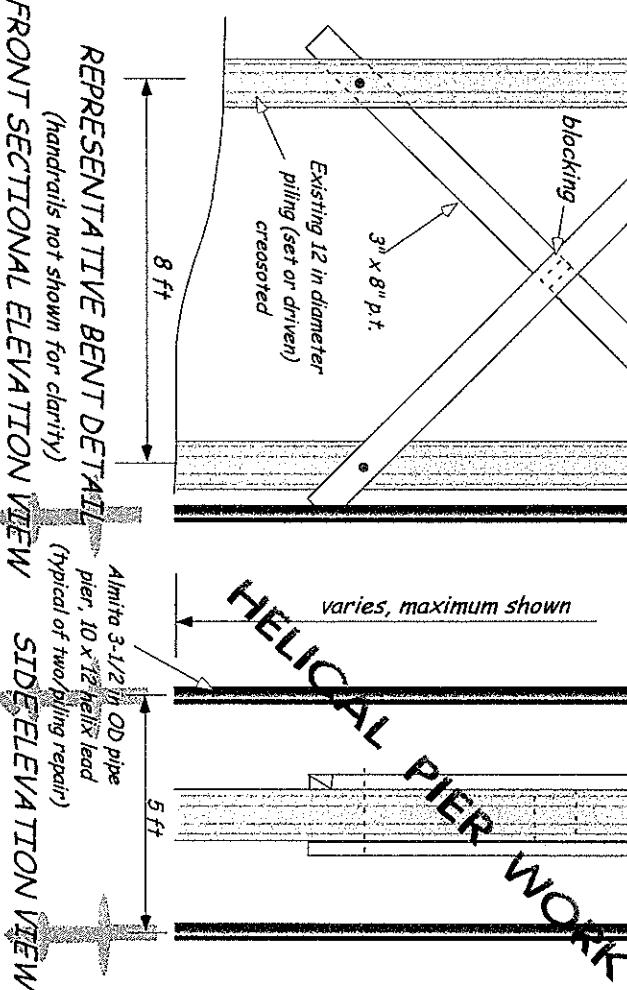
(10) Identified positions from the 2003 boardwalk inspection for pile cap replacement are pier #: 27, 48, 88, 90, 93, 96, 146, L43, L46, L50. Note that additional pile cap replacement might be required since the 2003 inspection. Total number of pile caps to be replaced 11 this item. Extra wood allowed for blocking and pile caps as contingency planning.

(11) Total number of piers (2 for each pile replacement, 4 for each pile cap replacement) for pile replacements: 44 for pile cap replacements. Total of 82 piers and brackets. Estimate pier length, average at 28 feet.

(12) 12" x 12" blocking under pile cap may be placed either side depending on conditions found.

See Note 4

6 x 12 each side, 5/8" x 18"
drifts vertically, one each side,
drift pile cap if this is a pile
replacement only



Piling and/or Piling Cap Replacement

Two Underpinning Techniques for Thousands of Applications

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Juneau, Alaska 99801

tel: 907-780-2719
cell: 907-321-5656

Date: Scale: Drawn: Sheet:
10/10/2006 1 in = 2-1/2 ft E. L. Bowen 16



Figure 1: Piling and Piling Cap Repair

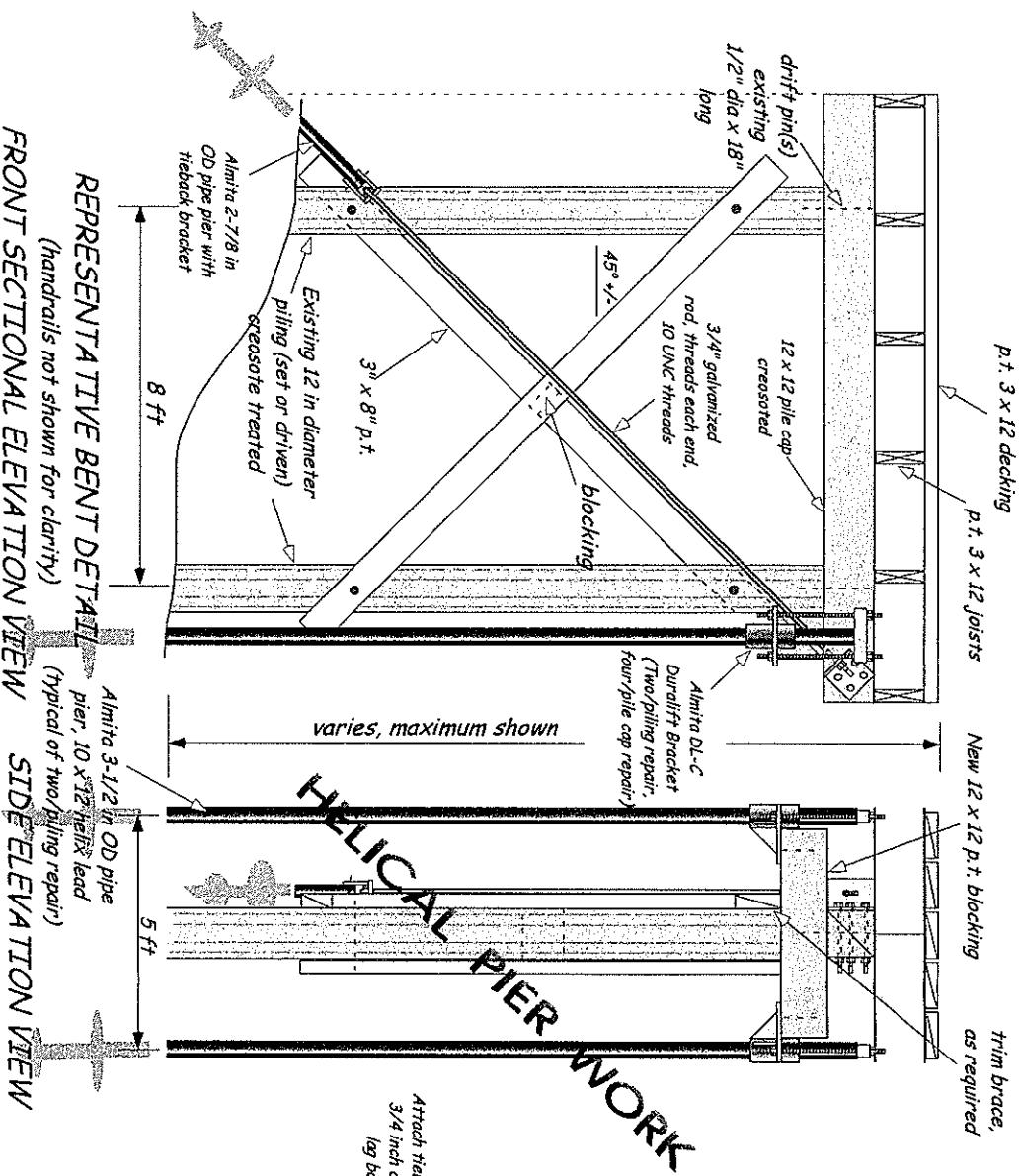
Helical Piles: For soft ground: Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout. Perfect
for difficult ground containing boulders, organics or other contaminants

p.t. 3 x 12 decking

New 12 x 12 p.t. blocking
as required

trim brace,



NOTES

- (1) Visible portion of tieback pier to fall within foot print of boardwalk. Adjust the rod angle accordingly.
- (2) Tieback bracket per Almita Drawing No. 05-019, dated 6/24/2005.
- (3) If the tieback pier cannot penetrate the ground due to rock, use Titan 30/16 injected boring rod. Minimum bored length into rock is 3 feet. Use Titan 30/16 rod, metallized with nut. Form tieback bracket by welding loop to nut similar to Almita detail. (Detail not shown)
- (4) If helical pier tieback reaches refusal (spin out) within 5 feet of ground surface measured on the slant, retrieve helical pier and install IBO rod. Otherwise 4000 ft-lbs torque minimum on helical pier.
- (5) Tieback placement is inter-tidal work.

(6) Tieback rod is 3/4 inch galvanized with 12 inches of thread both ends. (10 UNC threads) The contractor must be prepared to cut and thread one end or use all thread and coupler nuts. No fine threaded bolt material is to be used.

(7) Only place tiebacks where piling is badly deteriorated or where the piling is out-of-plumb, based upon the center line 3 1/4" in 4 ft or more. Estimate half of the piling to be repaired require a tieback. Where piling tilts towards the proposed tieback, place tieback to oppose lean. Tiebacks are tension anchors only.

(8) Fasteners required for tieback: Piling repair only: (4) 18 inch long bolts with 8 inches thread, malleable washers and nut, all galvanized. For pile cap replacement see detail below for fasteners.

(9) Place tieback pier slightly offset to clear rod of bracing, utilities, and other obstructions if required. Adjust tieback bracket for other rod angles as necessary.
Attach tieback bracket with (4) 3/4 inch diameter x 10 in long lag bolts (galvanized)
See Note 4

6 x 12 each side, 5/8" x 18" drifts vertically, one each side.
drift pile cap if this is a pile replacement only, pre-drill to avoid splitting wood

DETAIL

Piling and/or Piling
Cap Replacement Brace
Attachment Detail



Figure 2: Tieback Installation

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4511 Chelsea Court
Juneau, Alaska 99801

Tel: 907-780-2719
Cell: 907-321-5556

Date: Drawn: Sheet:
10/10/2006 1 in = 2-1/2 ft G. L. Bowen
2/6

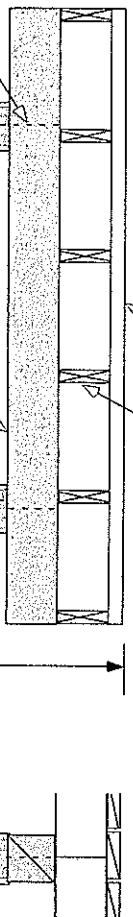
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Helical Piers: For soft ground: Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout. Perfect for difficult ground containing boulders, organics or other contaminants.

p.t. 3 x 12 decking

p.t. 3 x 12 joists



(1) Replacement brace, minimum length 14 ft, p.t. #1 Douglas Fir (northand) or better, block at intersection with 3" x 8" x 12" long, end nailed with (3) 40d, common, galvanized each side.
+/- 5° from 45° standard angle.

(2) Replacement bolt, 3/4 inch diameter, coach head, 18 inches long, maleable washer, galvanized, use same hole as the original 5/8 inch diameter bolt, if possible, but with original bored hole cleaned out. Keep minimum distance from bolt center to end of brace 6 inches, center the bolt in the brace.

(3) Bent details vary along the boardwalk. Detail shown is representative but is not typical for all bents.

(4) Existing drift pin type, size, number, and length not completely known. Records show 1/2" diameter by 18" long were purchased.

(5) All replacement wood to be suitable for structural joists and planks, #1 Douglas Fir (northand) or better, no #2, #3, or economy grades to be used.

(6) Replacement wood to meet AWPA Standard C18-03.

(7) Identified positions from the 2003 boardwalk inspection for missing or replacement braces are bent #: 2, 5, 14, 131, 132, 133, 139, 143, 144, 157, 163, 164, 165, 174, L51. (Total of 15). Note that additional braces may be required since the 2003 inspection. Wood estimated is quote for 34 brace replacements.

(8) There are other missing cross braces. See Table 1 of PNAD study. If funding AND these may also be replaced.

NOTES

REPRESENTATIVE BENT DETAIL (handrails not shown for clarity)

FRONT SECTIONAL ELEVATION VIEW

SIDE ELEVATION VIEW

REPLACEMENT IN KIND AND HELICAL PIER OTHER WORK



TWO UNDERPINNING TECHNIQUES FOR THOUSANDS OF APPLICATIONS

Helical Piers: For soft ground: Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout: Perfect for difficult ground containing boulders, organics or other contaminants.

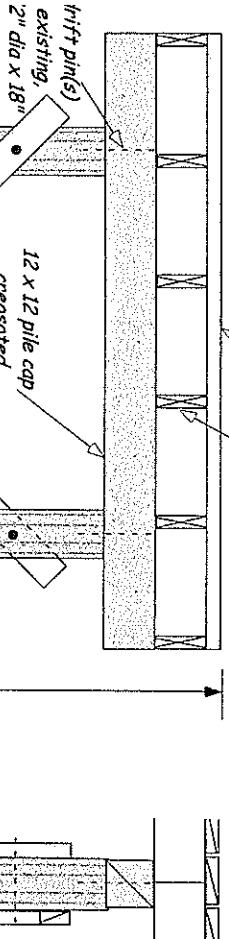
Figure 3: Brace Replacement

BOWEN ENGINEERING 4511 Chelsea Court Juneau, Alaska 99801 tel: 907-780-2719 cell: 907-323-5556	Date: _____ Scale: _____ Drawn: _____ Sheet: _____
	10/10/2006 1 in = 2-1/2 ft G. L. Bowen 3/6

p.t. 3 x 12 decking

PILE CAP REPLACEMENT

NOTES



- (1) Replacement 12" x 12" pile cap, minimum length 14 ft, p.t. #1 Douglas Fir (north) or better, trim to fit.
 (2) Remove decking, handrail and stringers from spans each side. Cut existing pile to pile cap drift pins with reciprocating saw (wedge up pile cap with steel wedges for blade clearance).
 (3) Place new pile cap with new 5/8" x 18" drift pins, pre-drilled. Reinstate stringers, deck, and handrail as required.

PILING REPLACEMENT

- (1) Shore boardwalk, limit traffic to foot traffic only, remove cross braces at subject piling.
 (2) Chain saw out the existing piling and remove debris to City of Pelican approved site.
 (3) Dig out for a 2-1/2 ft x 2-1/2 ft x 9 inch thick precast footing. Place the footing at a similar depth to the existing footing or deeper. If the piling to be replaced is driven, place the footing on top of the cut off piling at a depth of 2 ft below the ground surface.
 (4) Set piling on footing and attach, trim, wedge and drift pin to the piling cap.
 (5) Remove shoring, replace cross braces.

GENERAL

- (1) Bent details vary along the boardwalk. Detail shown is representative but it is not typical all bents.
 (2) Existing drift pin type, size, number, and length not completely known. Records show 18" diameter by 18" long were purchased.
 (3) All replacement wood to be suitable for structural joists and planks, #1 Douglas Fir (north) or better. No #2, #3, or economy grades are to be used.
 (4) Replacement wood to meet AWPA Standard C18-03.
 (5) Pile caps to be replaced per Table 4 is 11. Piling to be replaced per Table 4 is 19.

Precast concrete footing 2 ft 6 in x 2 ft 6 in x 9 in
 3 inches minimum cover over #5 rebar at 6 inch centers
 both directions, 4000 psi concrete, Type II cement, Steel strap
 is 4 in x 3/8 in thick, bend in U-shape, 12-1/2 inch clear
 at footing top, drill 7/8" diameter hole to receive 3/4" diameter coach bolt, holes to align horizontally.

FRONT SECTIONAL ELEVATION VIEW

SIDE ELEVATION VIEW

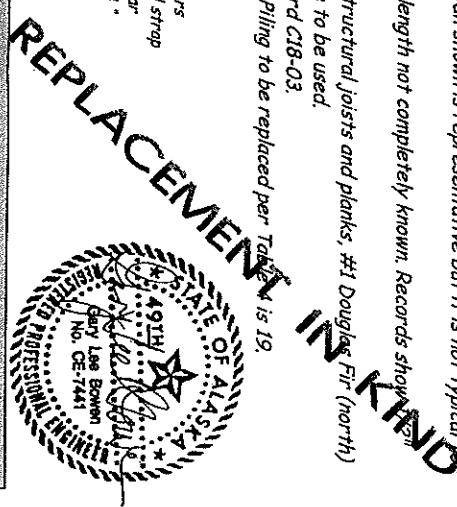


Figure 4: Piling/Pile Cap Replacement

Two Underpinning Techniques for Thousands of Applications

Helical Piers: For soft ground: Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout; Perfect for difficult ground containing boulders, organics or other contaminants.

BOWEN ENGINEERING
 4511 Cheshed Court
 Juneau, Alaska 99801

Tel: 907-780-2719
 Cell: 907-321-5556

Date: Scale: Drawn: Sheet:
 10/10/2006 1 in = 2-1/2 ft G. L. Bowen 46

Helical Pier Work (Based upon 19 piles, 11 pile caps replaced, 42 tiebacks)

Replacement-in-Kind based upon 19 piles and 11 pile caps, no tiebacks

- (1) Drift pins: 5/8 in dia x 18 in long, galvanized (existing pile cap to new blocking support and new pile cap to new blocking), 144 each
- (2) Log bolts: 3/4 in dia x 8 in long, galvanized, (Dura-Lift brackets to new blocking), 200 each
- (3) Tieback rod: 3/4 in dia x 5 ft long all thread 10 UNC, 4 long nuts per tieback, galvanized (pier to new blocking, rod connectors), 840 ft, 168 rods
- (4) Bolts: 3/4 in dia x 18 in long nut, maleable washer, 8 in thread, galvanized, (tieback bracket to new blocking, pile replacement only), 90 each
- (5) Log bolts: 3/4 in dia x 10 in long, galvanized, (tieback bracket to new 6 x 12, piling cap replacement only), 50 each
- (6) Tieback bracket: 8 in long piece from 8 in x 8 in x 1/2 in thick equal leg angle, galvanized, drilled for bolts (see drawing), 42 each
- (7) Almita pipe piers: 3-1/2 in OD 10 ft long lead section, (P/N B104-CD), 10 in x 12 in in helix, galvanized, 82 each
- (8) Almita pipe piers: 3-1/2 in OD 10 ft long extensions, (P/N B104-EX), galvanized, 82 each
- (9) Almita pipe piers: 3-1/2 in OD 7 ft long extensions, (P/N B7-EX), galvanized, 82 each
- (10) Almita pipe piers: 2-7/8 in OD, 7 ft long, (P/N B7-BC), galvanized, 8 in x 10 in helix, 42 each
- (11) Almita pipe piers: 2-7/8 in OD, 7 ft long, (P/N B7-EX), galvanized, 42 each
- (12) Almita tieback bracket: 2-7/8 in OD pier, (P/N AUS-C), galvanized, 42 each
- (13) Almita Dura-Lift C bracket: 3-1/2 in pier bracket, (P/N DL-C), galvanized, 82 each
- (14) Titan 30/16 180 rod; contingency planning for tiebacks, metallized, 200 ft, 20 nuts
- (15) Cement: 80 lb bags, Type II, (filling pipe piers, grouting, setting rods in rock), 150 bags
- (16) Blocking timbers: 12 in x 12 in x 4 ft, 5 in long, DR#4 (north), pressure treated, 45 each (2700 BF)
- (17) Beams at pile caps: 6 in x 12 in x 14 ft, DR#4 (north), pressure treated, 30 each (2520 BF)
- (18) Beams at pile caps: 6 in x 12 in x 16 ft, DR#4 (north), pressure treated, contingency planning, 12 each (1922 BF)
- (19) Misc materials: 2 gallons Galvacan paint (for touch-up); brushes, chromium trioxide, preservative.

Other Work (Associated with Helical Pier Work, Replace-in-Kind Braces at 17 pairs and Stringers at 7 sets)

- (1) Cross brace lumber: 3 in x 8 in x 14 ft long (17 pairs), pressure treated, DR#4 (north), 34 each, (952 BF)
- (2) Stringer lumber: 3 in x 12 in x 20 ft long (7 sets of 6), pressure treated, DR#4 (north), 42 each, (2520 BF)
- (3) Bolts: 3/4 in dia x 16 in long, nut, maleable washer, 8 in thread, galvanized, (brace replacement only), 72 each
- (4) Nails: 40d galvanized common, blocking or cross braces, 20 lbs
- (5) Nails: Toe nails at stringers and decking, 8d common galvanized, 100 lbs

Equipment Required for Helical Pier Work

- (1) Bobcat with Digga 8200 ft-lb hydraulic power head
- (2) Arc welder
- (3) ATV and trailer
- (4) Chainsaw
- (5) Small tools
- (6) 4 wheel drive forklift for load/unload from landing craft
- (7) Grout pump



State of Alaska
Lee Bowen
No. CE-7441

Two Underpinning Techniques for Thousands of Applications

Helical Piers: For soft ground. Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout. Perfect for difficult ground containing boulders, organics or other contaminants.

BOWEN ENGINEERING				Figure 5. Materials and Equipment List			
4511 Cheseau Court Juneau, Alaska 99801							
	Date:	Scale:	Drawn:		Sheet:		
	10/13/2006	None	G. L. Bowen		5/6		

Repair (Piles and Pile Caps) Utilizing Helical Piers and Imported Labor

Materials	\$147,000
Labor	82,000
Equipment	15,000
Mobilization and Shipping	<u>54,000</u>
Subtotal	\$298,000

Other Required Repairs Utilizing Imported Labor

Materials	\$ 9,600
Labor	38,400
Equipment	1,500
Mobilization	1,500
Subtotal	\$51,000

TOTAL

\$349,000

Note: Numbers include estimated OH/I/O of 35% plus 12% escalation and contingency. Shipping and mobilization are intermixed because equipment must be shipped as well as materials. Additional costs will be inspection and bid document preparation as well as environmental permitting.

Repair (Piles and Pile Caps) Utilizing Helical Piers and Local Labor

Materials	\$147,000
Labor	67,000
Equipment	15,000
Mobilization and Shipping	<u>50,000</u>
Subtotal	\$279,000

Other Required Repairs Utilizing Imported Labor

Materials	\$ 9,600
Labor	31,900
Equipment	1,500
Mobilization	1,000
Subtotal	\$44,000

TOTAL

\$333,000

Note: Numbers include estimated OH/I/O of 35% plus 12% escalation and contingency. Shipping and mobilization are intermixed because equipment must be shipped as well as materials. Additional costs will be inspection and bid document preparation as well as environmental permitting.

Repair (Piles and Pile Caps) Replace in Kind and Local Force Account Labor

Materials	\$ 31,000
Labor	\$ 209,000 to 418,000
Equipment	13,000
Mobilization and Shipping	<u>33,000</u>
Subtotal	\$286,000 to 495,000

Other Required Repairs Utilizing Imported Labor

Materials	\$ 8,600
Labor	28,600
Equipment	1,300
Mobilization	1,300
Subtotal	\$39,800

TOTAL

\$326,000 to \$535,000

Note: Numbers include estimated admin fee of 20% plus 12% escalation and contingency. Shipping and mobilization are intermixed because equipment must be shipped as well as materials. Additional costs will be inspection and bid document preparation as well as environmental permitting. A large variation can exist in this cost based on work plan and supervision.



Two Underpinning Techniques for Thousands of Applications

Helical Piers: For soft ground. Quick, easy and the cheaper technique.

Injected Boring Rod: Hollow drill steel injected with cement grout. Perfect for difficult ground containing boulders, organics or other contaminants.

Figure 6: Estimated Costs

BOWEN ENGINEERING 4511 Chelsea Court Juneau, Alaska 99801 tel: 907-730-2719 fax: 907-739-3376	Date: 10/14/2006	Scale: None	Drawn: G. L. Bowen	Sheet: 6/6
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COST CALCULATIONS

APPENDIX I

Drift pin total = 120, allow for bent or lost pins during installation (24) = 144 total
 1 each, pile cap repair) = (4 per pile cap repair) x (11 pile caps) = 44
 5/8 inch diameter x 18 inch drift pins, galvanized, (new pile cap 6 x 12 to new blocking,
 each, piling repair) x (19 piles) = (38) (2) = 76 drift pins.
 5/8 inch diameter x 18 inch drift pins, galvanized, (existing pile cap to new blocking, 2
 each,

Materials:

(1) *Helical Pier Contractor Work, Imported Labor*: The major item is to determine the costs of the pile cap and piling repair if it is to be done by an imported contractor:

Total Estimated Project Cost, Replace in Kind, Local Labor: \$326,000 to \$535,000

(Materials \$8,600; Labor \$28,600; Equipment \$1,300; Shipping and
 Mobilization \$1,300)

(2) Other work, local labor: \$39,800
 (Materials \$31,000; Labor [low] \$209,000; Equipment \$13,000; Shipping and
 Mobilization \$33,000)

(Materials \$31,000; Labor [high] \$418,000; Equipment \$13,000; Shipping
 and Mobilization \$33,000)

(1) Replace in kind, Piles and Pile Caps, Local labor: \$286,000 to \$495,000
 (Materials \$31,000; Labor [low] \$209,000; Equipment \$13,000; Shipping and
 Mobilization \$33,000)

CASE 2: Table 4, Replace in Kind, All Work (except no tiebacks), Local Labor

Total Estimated Project Cost, Helical Piers and Local Labor: \$323,000

(Materials \$9,600; Labor \$31,900; Equipment \$1,500; Shipping and
 Mobilization \$1,000)

(4) Other work, local labor: \$44,000
 (Materials \$147,000; Labor \$67,000; Equipment \$15,000; Shipping and
 Mobilization \$50,000)

(3) Helical pier work only, local labor, imported supervisor: \$279,000
 (Materials \$147,000; Labor \$38,400; Equipment \$15,000; Shipping and
 Mobilization \$1,500)

Total Estimated Project Cost, Helical Piers and Imported Labor: \$349,000

(Materials \$9,600; Labor \$38,400; Equipment \$1,500; Shipping and
 Mobilization \$1,500)

(2) Other work, imported labor: \$51,000
 (Materials \$147,000; Labor \$82,000; Equipment \$15,000; Shipping and
 Mobilization \$54,000)

(1) Helical pier work only, imported labor: \$298,000
 (Materials \$147,000; Labor \$82,000; Equipment \$15,000; Shipping and
 Mobilization \$54,000)

CASE 1: Table 4, Helical Pier Work Plus Other Required Work

COST SUMMARY:

COSTS

APPENDIX I

Bloking Timbers, 12 x 12 #1 DF pt for blocking during piling replacement, 4 ft 5 inches long, (19 + 22) = 41 pieces. Allow 45 pieces. BF = 2700 @ \$1375/m	Estimated cost from Mathieu's Lumber \$ 3,720
Timbers, 6 x 12 #1 DF pt for pile cap replacement, 2 per pile cap replacement, 14 ft long, (2) x (11) = 22 pieces, allow for 30 pieces or 1848 BF @ \$1375/m	Estimated cost from Mathieu's Lumber \$ 2,541
Timbers, 6 x 12 #1 DF pt for pile cap replacement (to be cut as required), 16 ft long, 12 pieces, (12) (6) (16) = 1152 BF @ \$1375/m	Estimated cost from Mathieu's Lumber \$ 1,584
Lag screws: (2) per bracket, 8" x 3/4", galvanized: (2) (82) = 164, Allow 200 lbs/each, total 9,668 lbs.	Estimated cost from Almita (P/N B10HCD): (\$250) (82) = \$20,500
Almita pipe piers, 3-1/2 in OD, 10 ft extensions, 82 total, 104.8 lbs/each, total 17,187 lbs	Estimated cost from Almita (P/N B10EX): 82 (\$200) = \$16,400
Almita pipe piers, 3-1/2 in OD, extensions, 82 total, 77.3 lbs/each, total 6,339 lbs	Estimated cost from Almita (P/N B7-EX) 82 (\$155) = \$12,710
Almita pipe piers, 2-7/8 in OD, 42 total, 8 in x 10 in helix lead section galvanized, 7 ft plus 7 ft extension galvanized (estimate 42 required). Lead section weight 61.5 lbs, plus extension weight 51 lbs. Total weight each = 102 or 4284 lbs total	Estimated cost from Almita each (P/N A8HBC and A7-EX) = \$125 + \$90 = \$215 or total = \$ 9,000
Tieback Rod in 10 ft lengths of galvanized all thread, 3/4 inch 10UNC @ \$2/ft, 20 ft per tieback, 42 total = \$1,680	Estimated cost from Almita tieback brackets for 2-7/8 in OD pier, 42 total, (P/N AUS-TB), 10.2 lbs each/ \$50 each: \$2,100.
Miscellaneous materials: Galvcoen paint (2 gallons for touch up), brushes, 60 ft galvanized 3" x 3" x 5/16 L, for bracing, CrO ₃ , IBO rod, preservative for touch up	Allow \$5,000

Overhead and Profit @ 35% = \$71,050, say, \$71,000

SUBTOTAL ALL COSTS: \$203,000

Subtotal: Mobilization and Shipping \$37,000 (reported in summary with O/H/P plus contingencies and cost escalation)

Allow \$25,000

Equipment would still require transport to Pelican.
Eight to Juneau. Note, availability on Pelican Seafarers barge may be limited and
craft: (2) (\$250) (1.15) + \$800 + (3 hr) (\$100) (4) = \$16950 or \$17,000. \$8,000 for
surcharge/4 wheel drive forklift each side \$800/3 hrs loading each end x 4/ 50 ton landing
Equipment/Materials/(2) 26 hours trips to Pelican and back at \$250/hr plus 15% fuel

Allow \$12,000

Greater Anchorage Area to Juneau \$3000, Pelican add an additional \$1000 (people only).

Mobilization and Shipping

(escalation)

Allow \$10,000 (reported in summary with O/H/P plus contingencies and cost

ATV/Trailer/Bobcat/Hydraulic Power Head/GROUT Pump

Equipment Use/Rental:

plus contingencies and cost escalation)

Subtotal Labor \$56,100, say, \$56,000 (reported in summary with O/H/P

Accommodation \$250/day for 30 days (3 people) = \$7500

Per item: (30) (3) (40) = \$3,600

(3) men, foreman and laborers: Davis Bacon wages + fringe), estimated 30 days work =
30 (60 + 90) (10 hr/days) = \$45,000

Labor:

plus contingencies and cost escalation)

Subtotal Materials: \$99,225, say, \$100,000 (reported in summary with O/H/P

150 bags @ \$15 =

Cement: (82 piers) (18 ft requiring fill) [(u) (0.25)²/4] 145 lbs (0.7 cement)/80 lbs/bag =
92 bags. Allow 150 bags with excess for casting pier ends in rock, 12,000 lbs.

Materials:

(2) Supporting carpentry work, imported labor
 Estimate by Mathews Lumber = \$1,849

Cross braces #1 DF, (34) 3 x 8 x 14 ft, 1428 BF @ \$1295/m
 Estimate by Mathews Lumber = \$3,263

Stringers #1 DF, (42) 3 x 12 x 20 ft long, 2520BF @ \$1295
 Estimate by Mathews Lumber = \$3,263

Bolts: $\frac{3}{4}$ inch diameter, 8 inches thread, hot dip galvanized, nuts and malleable washers,
 allow 72
 Nails 40d, galvanized common, 6 per x-brace, (34) (6) = 204, allow 220, or at 18/lb
 Allow 12 lbs \$100

Other nails, allow \$400

Subtotal Materials: \$6,552

Labor:

Bolts: $\frac{3}{4}$ inch diameter, 8 inches thread, hot dip galvanized, nuts and malleable washers,
 allow 72
 Nails 40d, galvanized common, 6 per x-brace, (34) (6) = 204, allow 220, or at 18/lb
 (2) men, foreman and laborer: Davis Bacon wages + fringe), estimated 15 days work = 15
 Per diem: (15) (2) (40) = \$1,200
 $(60 + 90)(10 \text{ hr/days}) = \$22,500$
 Accommodation (2 people) (15 days) (\$85) = \$2,550
 $\text{Allow } \$1000 \text{ for Subtotal Labor: } \$26,250$

Equipment:

Allow \$1000 for ATV and trailer
 Allow \$1000 for mobilization:
 $\text{Allow } \$1000 \text{ for OH/Profit } \$12,181$
Subtotal \$34,802

TOTAL PER INSTALLER CONTRACT (ESTIMATE) = \$298,000

Contingency/Cost Escalation, estimate at 12% = \$24,360, say, \$24,000

Filing and File Replacement

If a force account approach is taken where local labor is used and the City of Pelican administers the work under a percentage (say 20%) then the supporting capability effort described above (labor only) drops to about \$22,500 ($1.20 = \$27,000$). The other costs will include a 20% administration cost plus the 12% escalation and contingency number so the multiplier is 1.32. Thus materials is $(2930)(1.32) = \$3900$; labor is $\$22500(1.32) = \29700 ; Equipment \$1300; Shipping \$1300.

Other Work

Force Account Approach:

CASE 2: REPLACE IN KIND

Shipping of materials would be with the larger order.

Deduct for per diem, mobilization and accommodation: $(\$4750 + 47\%) = \6983 , say \$7000.
 Total deduct = \$13083 or \$13,000. Or (13,000) (1.47) for contractor O/H plus escalation
 Deduct per diem (\$2400 + 47%) = \$3528
 Deduct airfare (\$500 + 47%) = \$735
 Deduct mobilization from Greater Anchorage Area ($\$1500 + 47\% = \2205)
 Deduct Accommodation (\$150/day for 30 days + 47%) = \$6615
 (3) Helical Pier Local Labor (Except Supervisor)

Shipping is problematic for Pelican. The Alaska State ferry system no longer services the community. Neither Alaska Marine Lines, Northland Services, nor Reliable Transport go there either. There is landинг craft service from Juneau: Gumpfion Freight (ph 723-4099, cell, 789-4233, office) and Sea Level Transport (ph 321-3450, cell, ph 790-3450). Barge service from Seattle must be on a Pelican Seafloods barge (ph 735-2204).

labor and equipment)

TOTAL FOR SUPPORTING CAPACITY WORK \$51,159, say, \$51,000 (imported

Contingency/Cost Escalation at 12% = \$4,176

- Remove brace (1 man, 1 hr)
 - Reinstate bracing (1 man, 1 hr)
 - Lower piling in place, drift pin it and attach piling to base (2 men, 2 hrs)
 - Set precast concrete base (2 men, 1-1/2 hr)
 - Dig new foundation (2 men, 3 hr)
 - Dispose of piling to storage area (2 men, 1-1/2 hr)
 - Chain saw and remove piling (2 men, 2 hr)
 - Remove brace (1 man, 1 hr)
 - Cut drift pins at piling (1 man, 1 hr)
 - Erect shoring both sides of the piling to be removed (2 men, 1-1/2 hr)
 - Erect barriers allowing foot traffic only and place signage (1 man, 1/2 hr)
- Total man hours/pile = 28-1/2 man hrs or 4 man days. For 19 piles this is 76 man days.

For a piling replacement the lowest cost case will be when the workers work the tides and only get paid for the hours they are working. Under this circumstance, a possible scenario (without pile cap replacement) could be as follows:

- For 11 pile caps = 33 man days
- Total man hours/pile cap (least cost) = 21.5 man hrs. Thus 3 man days.
- Dispose of old pile cap (1 man, 1 hr)
- Remove barriers and signage (1 man, 1/2 hr)
- Replace handrails (2 men, 2 hrs)
- Replace stingers and decking (2 men, 2-1/2 hrs)
- Place and drift pile cap to position (2 men, 1 hr)
- Load and bring new pile cap to position (2 men, 1/2 hr)
- Reciprocating saw to drift pins under pile cap and remove pile cap, (2 men, 1 hr)
- Remove handrail, place for re-use (2 men, 1 hr)
- Remove decking and stingers, stack for re-use (2 men, 2 hrs)
- Erect barriers to vehicular traffic and place signage (1 man, 1/2 hr)

In the lowest cost case, the labor will work very efficiently. In a piling cap replacement (in kind), these steps and labor budget are envisaged.

Lowest Cost Case:

$$\text{Decking/striker replacement wood: } 50 \text{ pieces } (1800 \text{ BF@\$1295/m}) = \$2330$$

$$\text{Railing posts: } 20 \text{ pieces } (140 \text{ BF@\$1295/m}) = \$180$$

$$\text{Railing replacement wood: } 40 \text{ pieces } (270 \text{ BF@\$1295/m}) = \$350$$

This estimate depends entirely on the productivity of the work force and the supervisory efficiency. Also, during pile cap replacement, the deck, railings, and strikers will need to be taken up. These may be found to require replacement so additional materials are ordered in for continuing piling.

$$(3) \text{ men, foreman and laborers: Davis Bacon wages + fringe), estimated 30 days work} = \\ 30 (60 + 90) (10 \text{ hr/days}) = \$45,000$$

Labor:

Subtotal Materials: \$23,270, say, \$23,000 (reported in summary with administration cost plus escalation and contingency, \$31,000)

$$\text{Decking/stirrups replacement wood: } 50 \text{ pieces } (1800 \text{ BF } @ \$1295/\text{m}) = \$2330 \\ \text{Railing replacement wood: } 40 \text{ pieces } (270 \text{ BF } @ \$1295/\text{m}) = \$350 \\ \text{Railing posts: } 20 \text{ pieces } (140 \text{ BF } @ \$1295/\text{m}) = \$180$$

$$\text{Precast concrete footings for pilings: } (19) (\$150) = \$2850$$

$$\text{Pilings 12 inch diameter, creosoted, } \$450/\text{each. } (19) (450) = \$8550$$

Allow
Miscellaneous materials: (brace bolts, gloves, reciprocating saw blades, small tools, etc)

$$\text{Estimated cost from Mathews Lumber } \$3,230$$

Pile Cap Timbers, 12" x 12" x 14 ft #1 DF pt for pile cap replacement, 11 pieces. Allow
14 pieces. BF = 2350 @ \$1375/m

$$\text{Estimated cost from Portland Bolt } \$780 \\ \text{Drift pin total} = 120, \text{ allow for bent or lost pins during installation (24)} = 144 \text{ total} \\ \text{each, pile cap repair} = (4 \text{ per pile cap repair}) \times (11 \text{ pile caps}) = 44 \\ 5/8 \text{ inch diameter} \times 18 \text{ inch drift pins, galvanized, (new pile cap 6} \times 12 \text{ to existing pile, 1} \\ \text{piling repair)} \times (19 \text{ piles}) = (38)(2) = 76 \text{ drift pins.}$$

Materials (both cases):

Double the piling costs because of the tides and double the pile cap replacement work because of the contingencies trying to remove decking and stirrups while attempting to keep the boardwalk open or \$418,000 with multiplier.

Highest Cost Case:

Total man days work only = 109 man days. There will also be loading/unloading, materials handling, etc. It is assumed the piling bases would be precast in Juneau and brought to Pelican. Allow another 25% or a total of 136 man days. With one supervisor and 2 laborers this is about (2) (60) (1.32) (2/3) (8) (136) + (1) (90) (8) (1.32) (1/3) (136) = \$114898. + \$43,042 = \$157939, say, \$158,000 or 209,000 with multiplier.

END

Additional Design and Document Preparation Work, If Required Allow \$15,000 Inspections

Other Costs:

It is assumed the City might make their equipment available and would receive some cost advantages on the shipping. This could make the budget more favorable.

Leave at \$25,000 because a landing craft will probably still be required.

Mobilization and Shipping:

Leave at \$10,000 allowance

Equipment:

Subtotal Labor \$56,100, say, \$56,000 (reported in summary with O/H/P plus contingency and cost escalation)

Accommodation \$250/day for 30 days (3 people) = \$7500

Per item: (30) (3) (40) = \$3,600

APPENDIX II

TABLE 4

TABLE 4: MEMBERS REQUIRING REPLACEMENT

Bent No.	Member Location	Problems	Recommended Replacement Schedule
2	Cross braces	Split cross brace	Within 2 years
5	Cross braces Outside stringer	Needs cross braces, none present Outside 4x12 stringer cracked	Within 2 years
6	Board beneath 2 nd pile from shore side	Pile is bearing on a broken board-	Within 2 years
14	Cross braces	Split cross brace	Within 2 years
21	Left pile	Poor condition with internal rot	Within 2 years
23	Blocking between outside (water side) pile and pile cap	Blocking is rotten	Within 2 years
27	Pile cap	Splits at both ends and along length	Within 2 years

48	Pile cap	Cracked entire length	Within 2 years	
57	Stringers	Rotten 3x12 stringers	Within 2 years	
59	Left pile	Severely deteriorated with cracking and algae growth	Within 2 years	
60	Left pile	Top 6' severely deteriorated	Within 2 years	
68	Left pile	Splits with deterioration inside	Within 2 years	
69	Left pile	Severely cracked pile with internal rot	Within 2 years	
86	Right pile	Leaning out of plane with partial pile cap bearing	Within 2 years	
88	Pile cap	Split along entire length	Within 2 years	
90	Pile cap	Split along entire length	Within 2 years	
93	Pile cap	Splits along entire length	Within 2 years	
96	Pile cap	Large splits	Within 2 years	
131	Cross brace	Split cross brace	Within 2 years	
132	Cross brace	Split cross brace	Within 2 years	
133	Cross brace	Split cross brace	Within 2 years	
137	Seaward pile	Hollow, severe deterioration	Within 2 years	
139	Cross brace	Split cross brace	Within 2 years	
141	3x6 pipe support beam	Support beam is split	Within 2 years	
142	Seaward pile	Bottom of pile is hollow and soft with 1/2" splits	Within 2 years	
143	Cross brace	Split cross brace	Within 2 years	
144	Cross brace	Split cross brace	Within 2 years	
145	Stringers	One rotten stringer, others are not	Within 2 years	
146	Pile cap	Deteriorated and soft pile cap	Within 2 years	
147	Stringers	One rotten stringer, others are not bearing on pile cap	Within 2 years	
148	Stringers	Two rotten stringers	Within 2 years	
149	Stringers	One rotten stringer, others are not bearing on pile cap	Within 2 years	
157	Cross brace	Split cross brace	Within 2 years	
158	Seaward pile	Splits entire length with internal detachment	Within 2 years	
163	Cross brace	Split cross brace	Within 2 years	
164	Cross brace	Split cross brace	Within 2 years	
166	Cross brace	Split cross brace	Within 2 years	
174	Cross brace	Rotten and split cross brace	Within 2 years	
175	Left pile	Severe pile splits and deterioration	Within 2 years	
177	Right pile	Severe pile splits and deterioration	Within 2 years	

Pelican Boardwalk Inspection and Assessment
September 26, 2003

Page 13

179	Left pile	End crushing at pile cap bearing, splits	Within 2 years
186	Left pile Stringer	Severe splitting and deterioration Cracked stringer	Within 2 years
188	Seaward pile	Severe pile splits and deterioration	Within 2 years
189	Right pile	Severe pile splits and deterioration	Within 2 years
197	Right pile Left pile	Severe pile splits and deterioration Severe pile splits and deterioration	Within 2 years
L43	Pile cap	$\frac{3}{4}$ " split entire length	Within 2 years
L46	Pile cap	Rotten pile cap	Within 2 years
L47	Pile cap	Rotten pile cap	Within 2 years
L50	Pile cap	Rotten pile cap	Within 2 years
L51	Cross braces	Split cross braces at connections	Within 2 years
L67	Right pile Left pile	Severe cracking and deterioration Severe cracking, pile completely split	Within 2 years

RECOMMENDATIONS AND EXPECTED LIFE

PIER CALCULATIONS

APPENDIX III

END

Note that the maximum torque we can supply will be either from an 8500 ft-lb driving head or a 12000 ft-lb driving head. The installer would need to determine which head would be suitable for the weight of the machine he would place on the boardwalk. At 8500 ft-lb of torque, the pier could support about 70,000 lbs (ultimate). So it is easily a 35 kip pier when column instability does not govern.

Note that we will grout all the pipes so instability should not be a problem at all. At least we should have a good solid 25 k per pier or 50 k allowable total with no problem.

Or $F_a = 11641.7 \text{ psi}$ for an allowable load of 30,268 lbs or 30.3 kips. If K had been taken as 1, then $KL/r = 174.1$ and the allowable load would be 4920 psi or 12,792.9 lbs or 12.8 kips per pier. Note that the true value of K will fall between these numbers.

$$F_a = \frac{23 (KL/r)^2}{12 \pi^2 E}$$

Thus $KL/r = (0.65) (12 \text{ ft}) / [0.827 / 12] = 113.2$. KL/r exceeds C_o , so:

$K = 0.65$ from Table C-C2.1 for bottom fixed, top fixed.

$$C_o = [2\pi^2 E/F_y]^{1/2} = 101.97$$

From AISC ASD design manual, Ch E:

For a 3.5 inch diameter pipe pier the following properties apply: OD: 3.50 in; ID: 2.99 in; wall thickness: 0.254 in; $A = 2.6 \text{ in}^2$; $I = 3.44 \text{ in}^4$; $S = 1.966 \text{ in}^3$; $r = 0.827 \text{ in}$; $F_y = 55 \text{ ksi}$. The length if unsupported to ground will be taken as 12 ft (maximum). This is an estimate based upon the longest measurements taken along the Pelican boardwalk.

The allowable stress for a steel column can be calculated from the Manual of Steel Construction, AISC, ASD, Chapter E.

The piers manufactured by Almita for the 3-1/2 inch diameter pipe piers are made from API 5CT Grade 55 pipe. It has minimum yield strength of 55,000 psi. The helical plates are ASTM A36 grade or CSA G40.21 44W grade (comparable).

APPENDIX III

Helical Pier Calculations

CALCULATIONS
BEAM (BLOCKING)

APPENDIX IV

END

Thus the blocking appears as satisfactory. Full utilization of the section in shear would result in a load capacity of 15 kips or a total 30 k load. This is an allowable load.

The reaction per pier is 13.9 kips, well within our allowable. The blocking is also OK. The minimum bearing area is no problem as we have plenty on the steel brackets (not the amount stated at the top of the data print out). Also, the shear is at 93% if the block is not split on the ends.

$$\begin{aligned} DL &= 2,500 \text{ lbs} \\ LL &= 26,200 \text{ lbs} \end{aligned}$$

The loads on pilings were calculated by PND. Look at a typical, if not harsh, example of pile loading. At bent #33 there is 17 ft of span between it and #32 and #34. Although the unbraced pile height is less than 10 ft for both piles, the LL per pile is 26.2k and the DL per pile is 2.7 kips on one side and 2.3 kips on the other side. Run BeamCheck2.4 for these numbers:

The piles are on 5 ft centres, the lip beneath the bracket is approximately 7 inches on each side so the clear span is 5 ft - 1/12 ft = 3.83 ft. There is a uniform load application of 50 kips over 1 ft or 50,000 plf. Check the ability of the 12" x 12" to carry this load:

The two piles collectively should easily support 50 kips allowable. Now consider the ability of the wood blocking to support loads from above.

Blocking (Beam) Calculations

APPENDIX IV

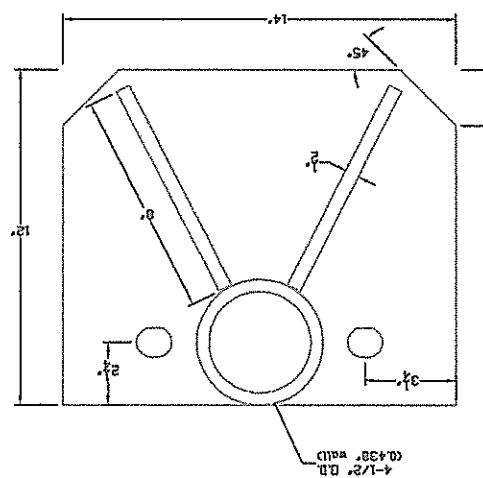
Beam Check V2.4 licensed to: Bowen Engineering File # 2308-64003		Bowen Engineering	
Prepared by: GLB Date: 10/03/06		Selection	
12x 12 DF North #1 Ld = 0.0 Ft		Conditions	
Wet Use, No Splices, NDS 97		Min Bearing Area R1 = 33.3 in ² , R2 = 33.1 in ² , DL Defl < 0.01 in.	
Data		Beam Span 3.83 ft Reaction 1 LL 18034 # Reaction 2 LL 12966 # Beam Wt per ft 32.14 # Reaction 1 LL 13948 # Reaction 2 LL 13875 # BM Wt Included 123 # Maximum V 13948 # Max Moment 23119 # Max V (Reduced) 13917 # TL Max Defl L / 240 TL Actual Defl L / > 1000 LL Max Defl L / 360 LL Actual Defl L / > 1000	
Attributes		Section (in ²) Shear (in ²) TL Defl (in) LL Defl	
Values		Fb (psi) Fv (psi) E (psi x mil) FC_L (psi)	
Base Values 1200 85 1.6 625		Base Adjusted 1200 170 1.6 419	
Adjustments		CF Size Factor 1.000 1.00 1.00 1.00	
CFP		Cd Duration 1.00 1.00	
CR Repellitive		Cr Shear Stress 1.00 2.00 (No Splices)	
CM Wet Use		Ch Shear Stress 1.00 1.00	
Cl Slability		Cl Slability 1.0000 RB = 0.00 Lc = 0.00 Ft Kbe = 0.0	
Loads		Par Unit LL Par Unit TL Start End H	
26000 H = 27700 1.41 2.41		SPAN = 3.83 Ft R1 = 13948 R2 = 13875	
Uniform and partial uniform loads are lbs per linear ft.			

ALMATA PRODUCT DRAWINGS
and HELICAL PIER LITERATURE

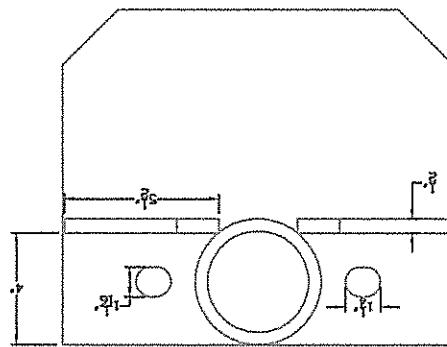
APPENDIX V

PROJECT HELICAL PIPE SYSTEMS				Dura Lift 312 Bracket For 3½" Piers			
DATE	REV	REVISIONS	SCALE	NTS	DRAWN BY	RAS	
16-Jun-05		05-016A					
PONDOKA, AB, CANADA	T4J 1J8						
PH: (403) 783-5880	FAX: (403) 783-2895						
E-mail: info@alift.ca	www.alift.ca						

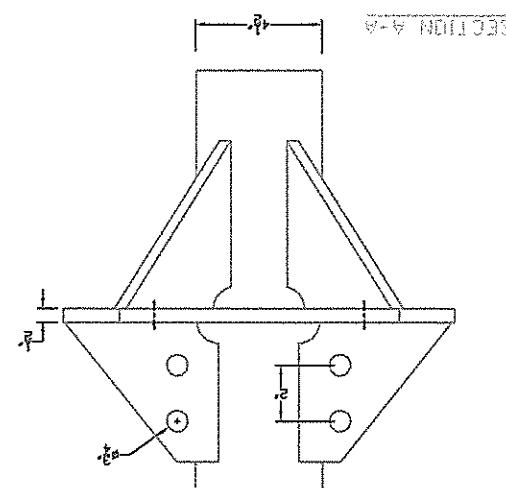
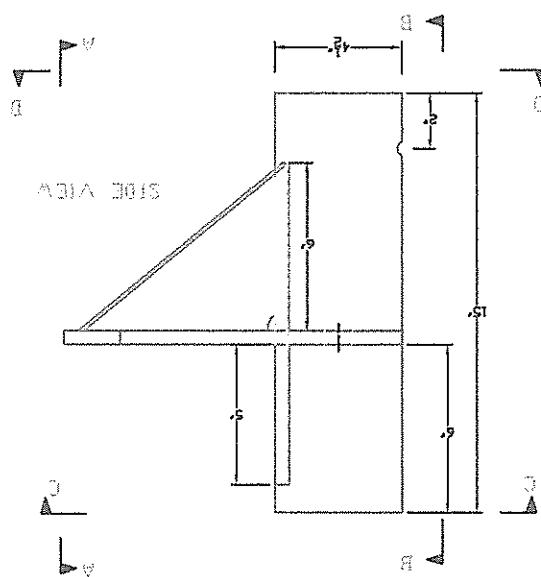
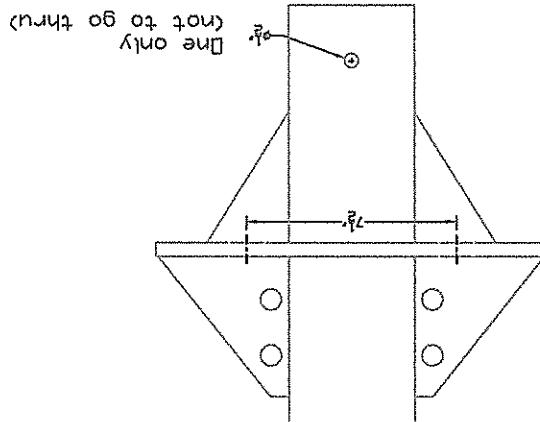
SECTION D-D



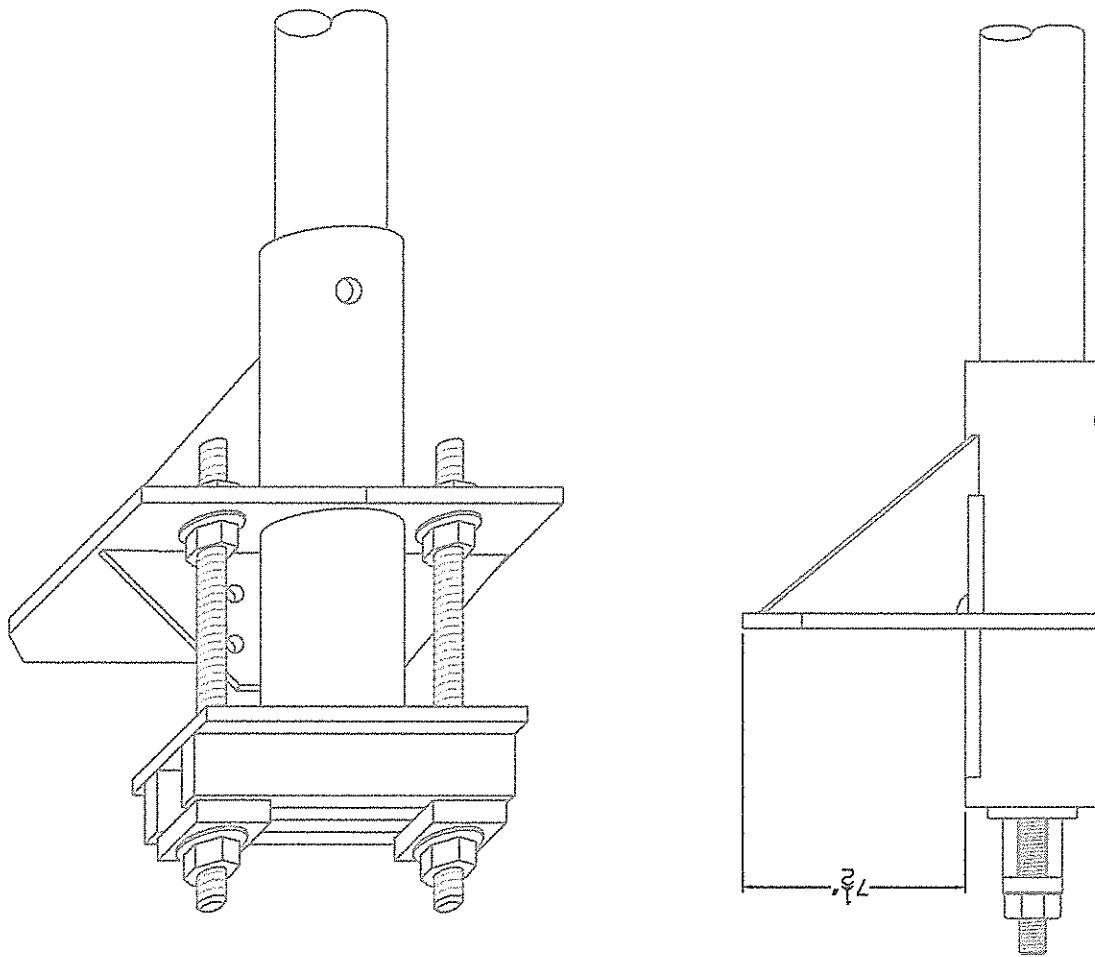
SECTION C-C



SECTION E-E



Dura Lift 312 Bracket Pkg.dwg				Dura Lift Bracket Assembly For 3½" Piers			
Drawing Title				Drawing No.			
DATE	NO.	REVISI0NS	SCALE	NTS	DRAWN BY	RAS	
16-Jun-05	05-016.C						
PONKA, AB, CANADA	T4J 1J8						
FAX: (403) 783-5800	1-800-363-4868						
E-mail: info@ponka.ca							



ALMITA
MANUFACTURING LTD

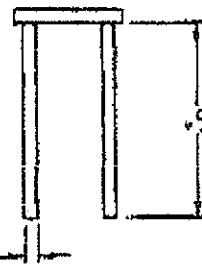
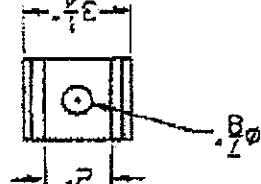
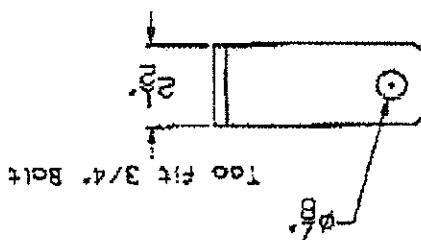
CEM-1001 (MFG) 787-029
PA (407) 723-5809 - 1-800-363-1868
1000-363-1868
MONDAY-FRIDAY 7AM-4PM
600-124-AVE

Project	HELCICAL PIER SYSTEMS	Split Sleeve & Connection	TS Fit Dn 2 7/8", Pier's	Split sleeve & Tiedring	Driver tube	Date 24-JUN-05	Refrence No. 05-Q19	NAME NTS	PHONE NO. 545-1145	PEANUT NO. HAG
---------	-----------------------	---------------------------	--------------------------	-------------------------	-------------	----------------	---------------------	----------	--------------------	----------------

- Galvanizing: Hot Dipped as per latest CSA Standard G164-M.
- Welding performed by shop qualified to CSA Standard W471.
- Welding: Welding, materials and procedures configured to latest CAN/CSA Standard W59.
- Structure: Steel, steel sections configured to latest CAN/CSA G40.20, Grade A36.
- Minimum yield strength of 55 ksi and a minimum tensile strength of 75 ksi.
- Shafte Pipe shall meet or exceed the minimum requirements of API 5CT Grade 55.

NOTES:

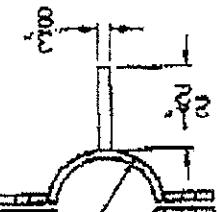
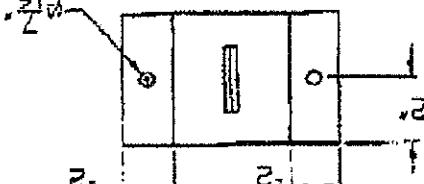
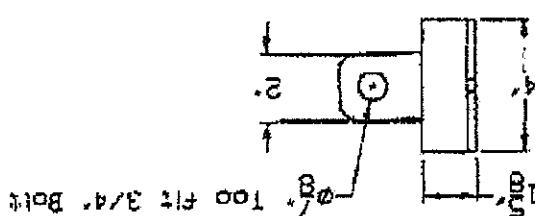
PIER 3D PIER TIEBACK BRACKET



8", Typical on plate

SPLIT RING CLAMP (one half piece with tabs and one without)

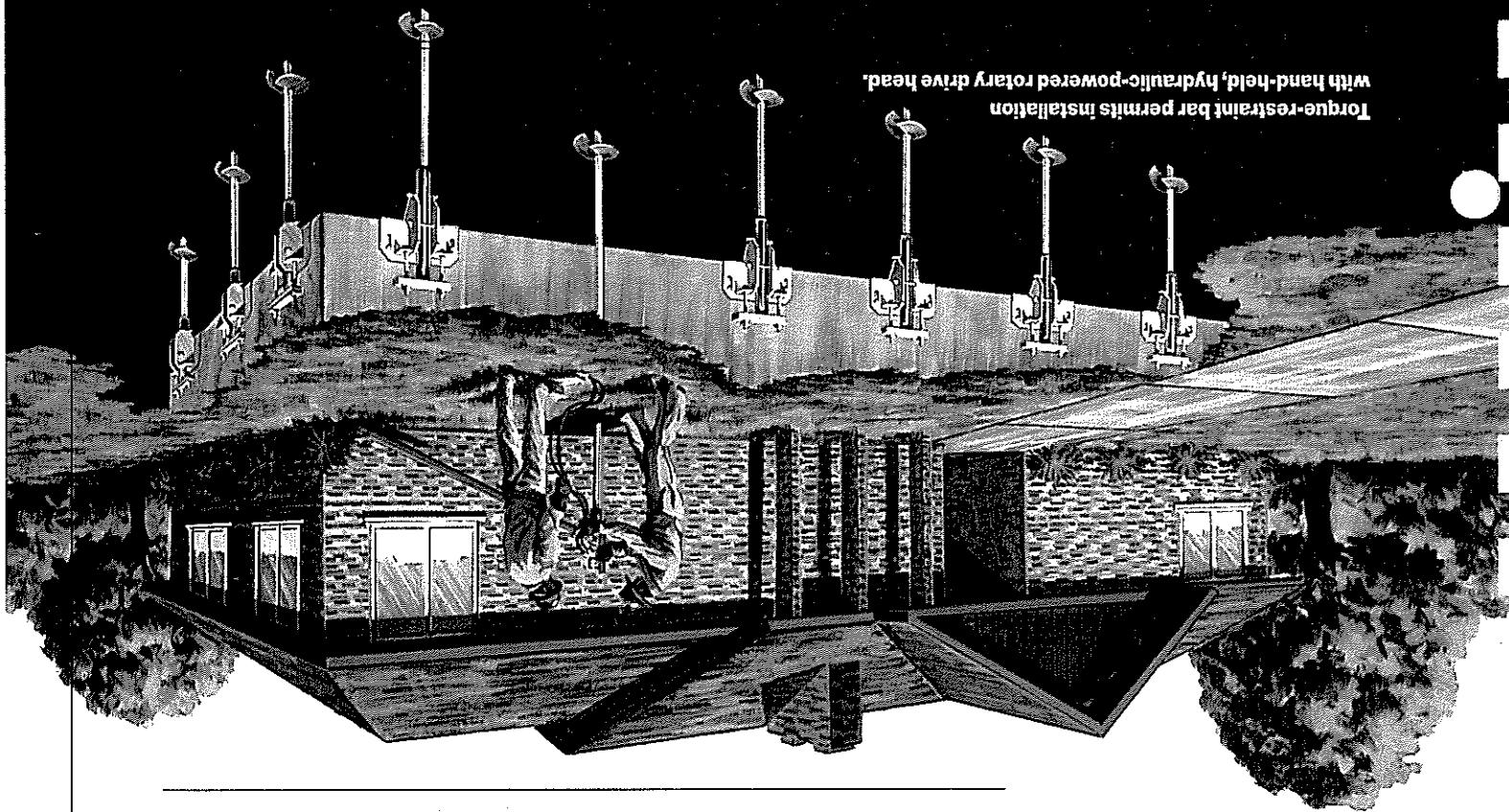
100 ft 1/2" Bolt



1/2", Typical of 4 tabs

Pipe section cut in half

-0.35" (0.854mt)



With hand-held, hydraulic-powered rotary drive head.
Torque-restraint bar permits installation

conventional construction is impossible or difficult. In construction, their most exciting uses are those in which nate system to typical foundation and earth retention conventional foundation designs are simply not feasible. Even though steel screw anchors can be used as an alter- "expected" soil conditions rarely exist. Partic- ually with rehabilitation work. Many times and retaining wall problems.

Although we hope, the "usual" and

many foundation

The solution to
and retaining
wall problems.

by Gary L. Seidler, P.E.

Versatile Steel Screw anchors

March 2000

Structural
Engineer

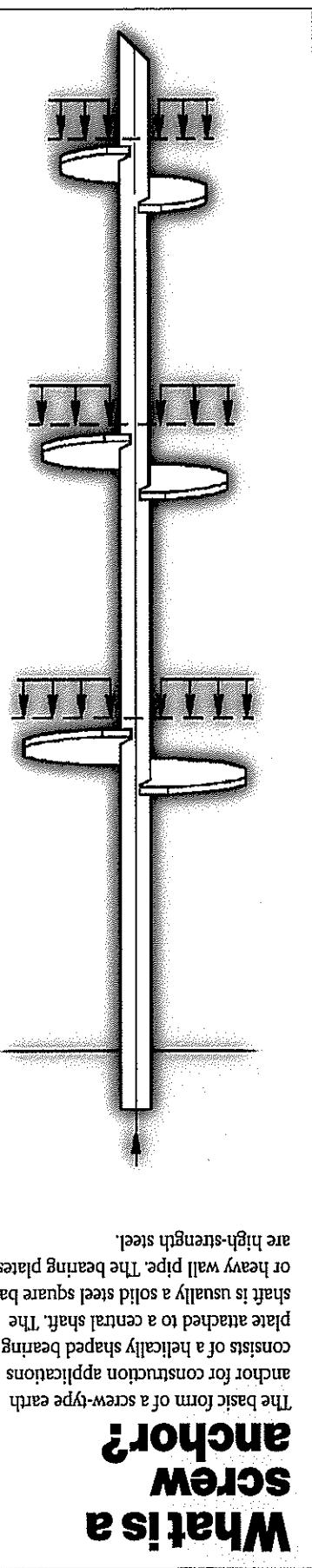
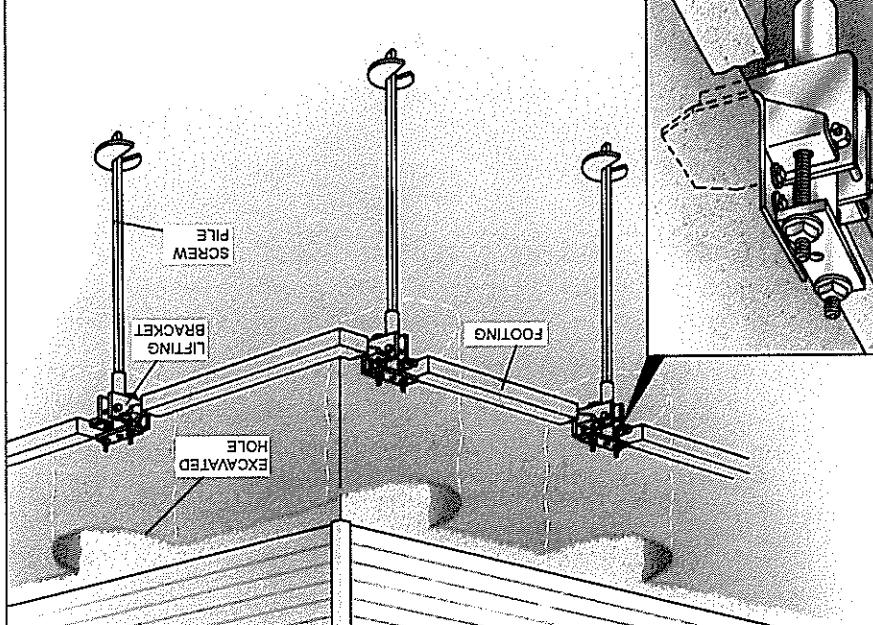
Reprinted from

common screw-type fasteners. Their installation requires no removal of soil. Screw anchors are spools to dispose of since installation usually for concrete or grout to cure. There are no immediate loading. There is no need to wait for concrete or grout to cure. There are no immediate loading. There is no need to wait for concrete or grout to cure. Their ease and speed of installation, screw anchors also offer the advantage of known for their ease and speed of installation.

designed "hand-held" installation especially installed in tight areas with special excavators). Screw anchors can even be mounted in hard-to-reach places, like holes drilled into the soil is accomplished by installation into the soil have been tested to 300 kips in compaction.

beating loads. The ultimate capacity of a screw anchor can be as high as 200 kips in uplift and some have been tested to 300 kips in lateral load. A screw anchor becomes a deep, end-bearing foundation used to both resist uplift and support lateral plates act as individual bearing elements to support a load. As such, a screw anchor plate becomes a deep, end-bearing foundation used to support a load and torque, the lateral load is half inch in diameter.

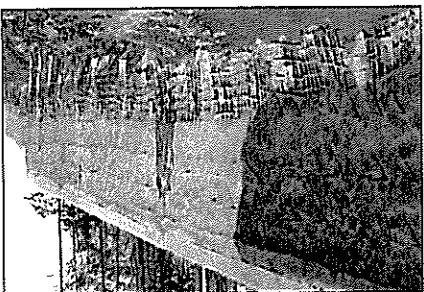
Underpinning with a pre-engineered system involves design to the specific job with practical, time-saving economics.



What is a SCREW ANCHOR?

The basic form of a screw-type earth anchor consists of a helically shaped bearing plate attached to a central shaft. The shaft is usually a solid steel square bar or heavy wall pipe. The bearing plate is usually a central shaft. The plate is attached to a central shaft.

Veneers often used to face soil nail walls.



The same design methods previously discussed. As end-bearing foundations in tension using 120 kips. Screw anchor tiebacks are designed shaft sizes are available for design loads up to 120 kips. Screw anchor tiebacks are designed for working load. Greater lengths and design much square shafts, having 60 to 90 kips tensile are less than 40 feet long with 1-3/4 inch to 2

plane. The majority of screw anchor tiebacks the "load zone" soils well beyond the failure to active earth pressure from the wall face to These anchors are used to transfer loads due

Tieback Anchors

higher walls. Unlike driven piles, screw anchors are And unlike driven piles, screw anchors are heavy equipment near existing foundations. Additionally, there is no need to worry about held missiles in confined, interior spaces. Since they can even be installed with hand-screw anchors are ideal for remedial work trained and authorized certified contractors.

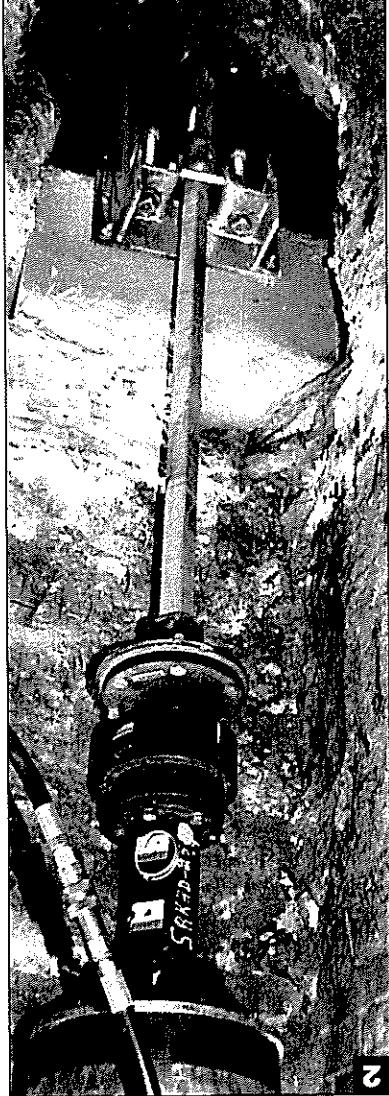
milling existing foundations. Screw anchors do auger-cast piles disrupt the soil, thereby under-pants. Other deep foundation systems such as operate with little inconvenience to its occupation-free. The building can continue to vibration-free. The building can even be installed with driven piles, screw anchors are heavy equipment near existing foundations. Additionally, there is no need to worry about held missiles in confined, interior spaces. Since they can even be installed with hand-screw anchors are ideal for remedial work trained and authorized certified contractors.

condition. This system is only installed by further settlement or lift it back to near original positions and either stabilize the structure against item to attach the anchor to a panelled system. Complete solution. Hence uses a panelled system to replace existing foundation cracking, heaving, or general foundation cracks dislodged from differential settlement can supplement or replace existing foundations simple. Remedial applications: screw anchors can easily be removed by reversing the installation process. This makes removal of temporary structures simple.

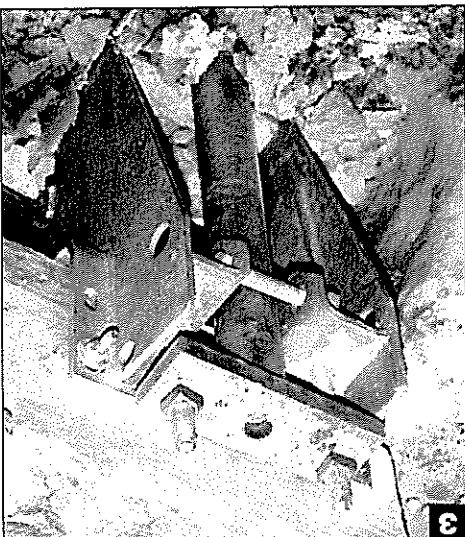
Temporary structures: screw anchors can need to be removed. Contaminated soils: screw anchors are deal for contaminated soils since no spoils need to be removed.

does not need to be interrupted.

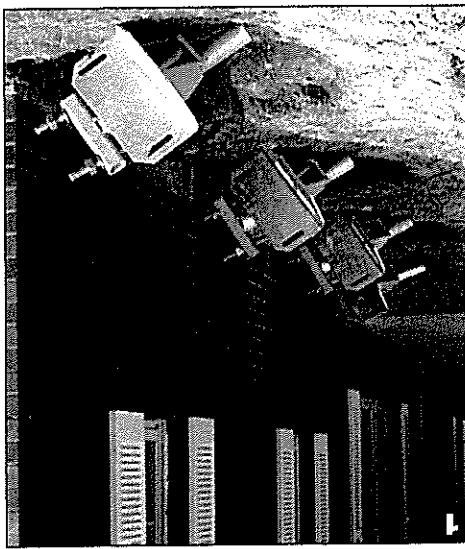
Screw Anchors can easily be removed by reversing the installation process.



3: Installed bracket transfers load to screw pile at each perimeter location.

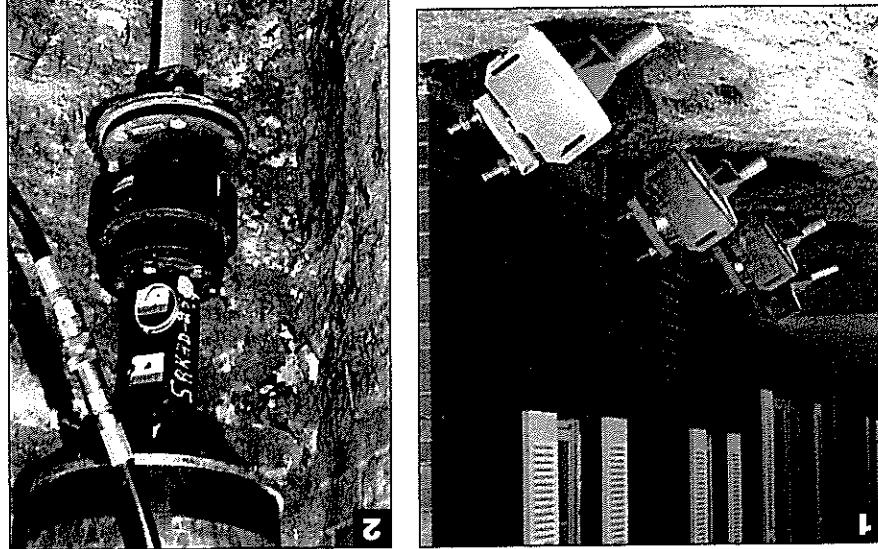
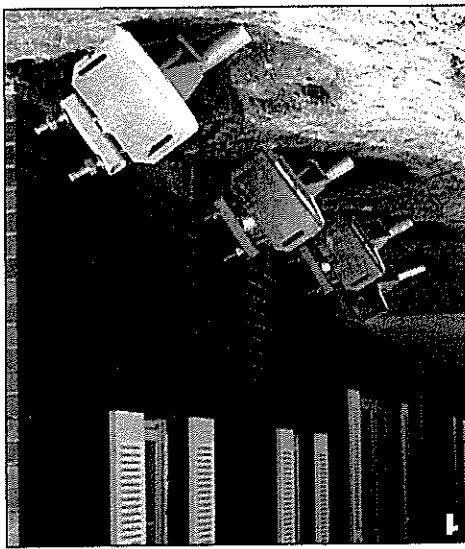
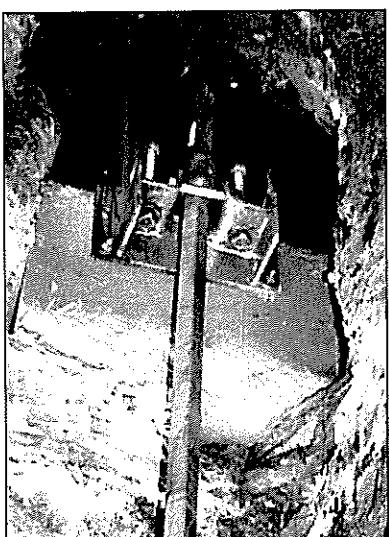


4: Foundation support brackets ready to mount on screw piles.



5: Installed bracket uses low-rpm, high-torque hydraulic motors.

6: Installed bracket transfers load to screw pile at each perimeter location.



Gary L. Stidder, PE, has worked for A.B. Chance/T-Hubbell in design and development as well as application/sales engineering for 13 years. He has three United States Patents covering bolted tendon systems and methods of screw anchor products.

Gary L. Stidder, PE, has worked for A.B. Chance/T-Hubbell in design and development as well as application/sales engineering for 13 years. He has three United States Patents covering bolted tendon systems and methods of screw anchor products.

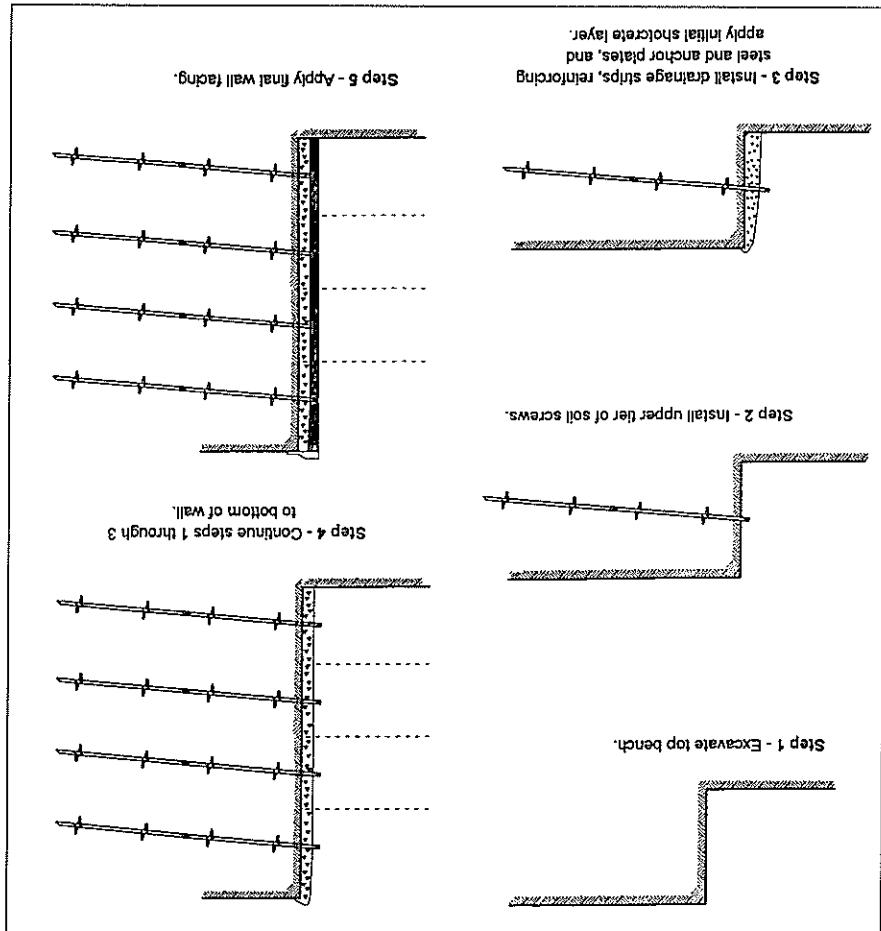
The advantages of screw anchors are five with advantages worthy of consideration for every project. ■

■ Conclusion

The advantages of screw anchors are numerous. The flexibility to install screw anchors with little vibration and no soil removal or restricted environments, in any weather, makes them the only practical solution for many projects. They are also a viable alternative to concrete anchors where beam and lag is not available.

Construction time is reduced since installation upon installation. Lesets will have a cleaner job site. And soil screws are ideal for use in fine-grained, clayey soils where grouted nails may not be suitable.

The top-down bench method coordinates with FHWA guidelines and industry computer-design aids for soil nail walls.



Advantages of soil nails over conventional tendons is not needed to install grouted tendons. They need to have a good stand up time.

Poorly suited for loose sand, soft plastic clay and soils with liquid index > 0.2 . Soil nail walls are constructed top down so they need to have a good stand up time.

Corrosion: $\text{SPT-N value} = 2000 \text{ ohm-cm}$

Proper drainage is important. Highly sensitive to water content. Since the soil walls - use caution with this type of application.

Good for stiff ($\text{SPT-N value} = 8$ or higher-clay, with low plasticity (CL)).

Best suited to cemented or medium dense to dense sands.

Soils: • Wall should have a slight batter to reduce load on footing.

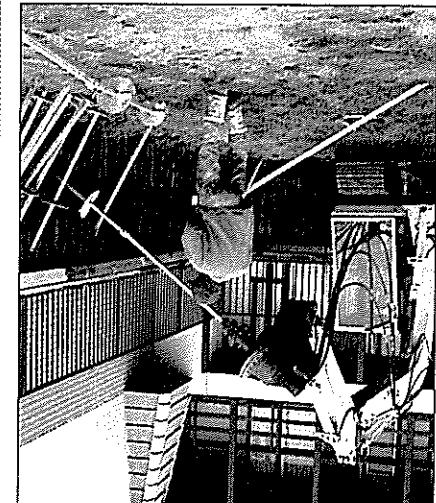
• Height — Unlimited but practical limitation is probably 40 feet.

Feasibility of soil nail walls

iy "soil nails", installed nearly horizontally to this earth retention system uses high capacity.

This "soil nail" system can be installed horizontally. There are no spalls to remove and lastly, the equipment is needed, saving excavation and can be accomplished in any weather and less installation (both permanent or temporary) tends: First, immediate proof loading is possible — no waiting for grout to cure and soil-pile/wall methods with sheet-pile required as with grouted tendons.

Advantages over conventional grouted tendons are immediate loading since no waiting is required as with grouted tendons.



NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

ANDERSON CHANCE® FARGO® HUBBELL® OHIO/PRAES® Hubbell Power Systems, Inc.

UNITED STATES	HUBBELL POWER SYSTEMS 159 Sim Ming Road Ronald Close Woburn Industrial Estate #05-08 Amtech Building Singapore 575625 MK42 7SH, England Phone: 65-4544772 Fax: 65-4544775 Phone: 44-1-234-843632 Fax: 44-1-234-841435 e-mail: sajeev@hubbell.com.sg HUBBELL CANADA, INC. 870 Brock Road South Pickering, Ontario L1W 1Z8 Phone: 905-831-6353 Fax: 905-831-1138 MEXICO HUBBELL DE MEXICO, S.A. DE CV Av. Coyacan No. 1051 Col. Del Valle 03100 Mexico, D.F. Phone: 525-575-2022 Fax: 02-515-0898 Phone: 02-515-0855 Taipeh, Taiwan Chiien Kwo North Road 12th Floor 96 Sec. 2 AV. Goyacan No. 1051 Col. Del Valle 03100 Mexico, D.F. Phone: 525-559-8626 Fax: 02-515-0899 e-mail: vlasat@hubbell-taiwan.com.tw e-mail: skao@hubbell-taiwan.com.tw
ASIA	HUBBELL S.E. ASIA PTE. LTD. 210 N. Allentown, Mo 65240 Phone: 573-682-8414 Fax: 573-682-8660 EUROPE HUBBELL POWER SYSTEMS 159 Sim Ming Road Ronald Close Woburn Industrial Estate #05-08 Amtech Building Singapore 575625 MK42 7SH, England Phone: 65-4544772 Fax: 65-4544775 Phone: 44-1-234-843632 Fax: 44-1-234-841435 e-mail: sajeev@hubbell.com.sg CANADA HUBBELL CANADA, INC. 870 Brock Road South Pickering, Ontario L1W 1Z8 Phone: 905-831-6353 Fax: 905-831-1138 MEXICO HUBBELL DE MEXICO, S.A. DE CV Av. Goyacan No. 1051 Col. Del Valle 03100 Mexico, D.F. Phone: 525-575-2022 Fax: 02-515-0898 Phone: 02-515-0855 Taipeh, Taiwan Chiien Kwo North Road 12th Floor 96 Sec. 2 AV. Goyacan No. 1051 Col. Del Valle 03100 Mexico, D.F. Phone: 525-559-8626 Fax: 02-515-0899 e-mail: vlasat@hubbell-taiwan.com.tw e-mail: skao@hubbell-taiwan.com.tw
CENTRAL & SOUTH AMERICA	Centralia, MO USA Cert. No. 001136 A. B. Chance Co. ISO 9001-1994

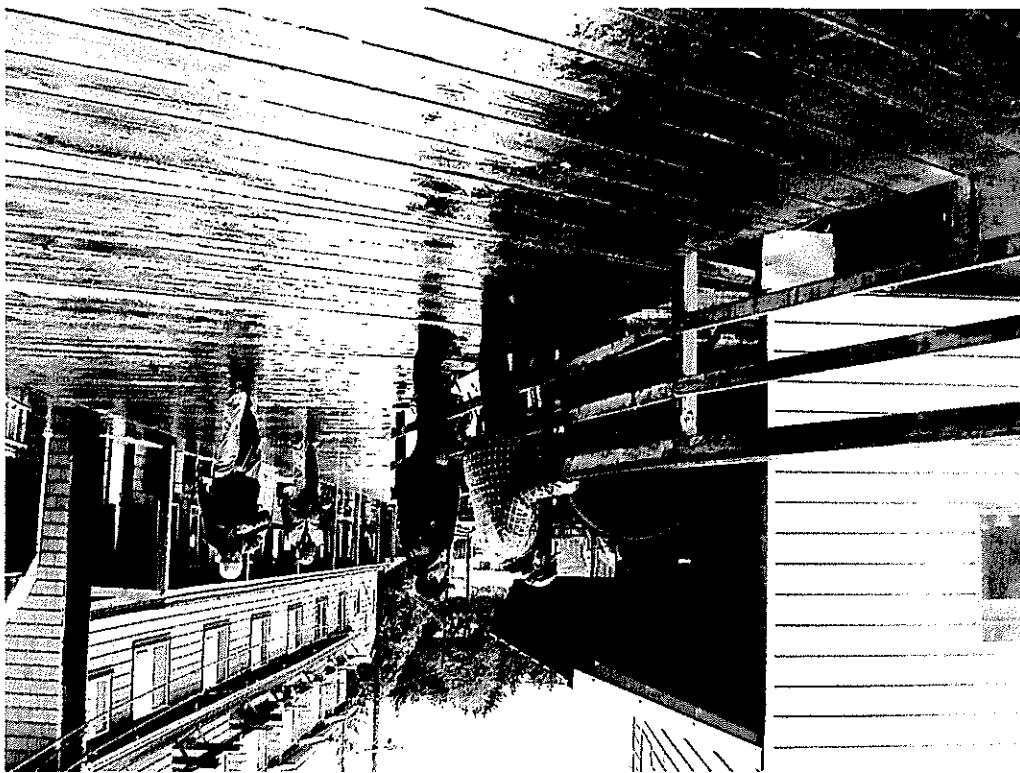


Web: <http://www.hubbell.com/abcchance>
 E-mail: hpscontact@hps.hubbell.com



PHOTOGRAPHS

APPENDIX VI

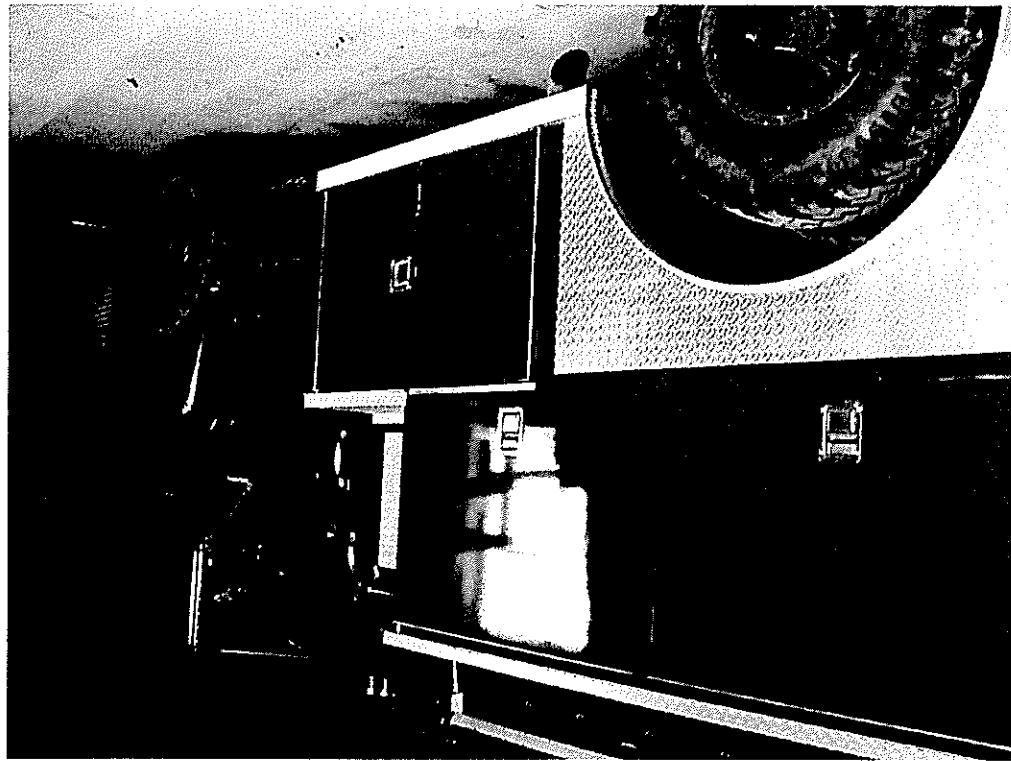


ABOVE: Typical pile cap to piling connection. Fastened by drift pins. BELOW: Curve in boardwalk requiring widening.





Above: 1984 GMC 7000 diesel fire truck parked in the City garage (design vehicle).
Below: Garbage truck working



**CONTRACTOR REQUIREMENTS,
SPECIFICATIONS and GENERAL
NOTES**

APPENDIX VII

- The contractor shall supply and install vertical helical piers per the contract drawings. There are also batter piers in this project. Use a batter pier whenever the criteria is met per Figure 2. The vertical piers will all utilize remedial lifting brackets. The batter piers may be either helical or TBO rods. The responsibility for installing the piers and brackets as well as any associated welding or fasteners is a rough carpentry. If the helical pier contractor is capable of performing this work, the scope of work is defined by Table 4 except for "other work" that is pure a price should be given as an option.
- The depth to pier lockup is unknown. The piers shall be of a 3-1/2 inch OD pipe shaft with 8 inch x 10 inch helix lead sections. A total of 27 ft has been allocated per vertical pier (two 10 ft lengths plus one 7 ft length). This should be more than adequate but a price for depths greater than this should be given. In addition, up to 42 helical tiebacks may be installed. See the drawings and the material list.
- The contractor shall keep installation records for inspection. These records shall include torque, installation depth, and location.
- It is requested that the contracting agency under a separate contract arrange for the installation of 3 test piers. This will allow the contractor to fix his price and provide confidence that a repair budget can be held.
- Piers shall not be moved from their designated position without the permission of the engineer or the engineer's representative.
- No spinout is to be allowed without an investigation for the adequacy of the pier installation. If piers spin-out (normally associated with rock), the spinouts must be consistent with each other. Otherwise the pier must be withdrawn and reinstalled at a different location. Some metal contamination may exist along the boardwalk. In any cost estimate prepared by the helical pier contractor for the contracting agency, the basis for the quote shall be identified in writing on the submittal.
- The contractor shall liaise with the engineer and the contracting agency agent if any subsurface discovery is made at the site.
- Prior to work, the boardwalk owner and the helical pier contractor shall agree on the location of the utilities and any site drainage pipes to avoid conflict with pier installation.
- The drilling contractor's work, once started, shall be completed without significant interruption.
- The helical pier contractor shall agree that he shall assume sole and complete responsibility for job site conditions during the course of work on this project.

Helical Pier Contractor:

In the absence of any agreement to the contrary, it is suggested that the following comments apply:

The contractor and the contracting agency are free to enter into any agreement they wish.

Contractor Requirements, Specifications, and General Notes:

APPENDIX VII

G. L. Bowen
10/3/2006
END

- Including the safety of all persons and property. This requirement shall apply continuously and shall not be held to normal working hours.
- The contractor shall make every effort to keep the boardwalk open to traffic at all times. This includes work suspension if required. An electronic liaison will be kept with the boardwalk owner.
- The helical pier contractor shall make every effort to keep the boardwalk open to traffic at all times. This includes work suspension if required. An electronic liaison will be kept with the boardwalk owner.
- The helical pier contractor shall make every effort to keep the boardwalk open to traffic at all times. This includes work suspension if required. An electronic liaison will be kept with the boardwalk owner.
- The helical pier contractor shall defend, indemnify and hold the engineer and owner harmless from any and all liability, real or alleged, in connection with the performance of this work, except liability arising from the sole negligence of the owner or the engineer.